APRIL 1987

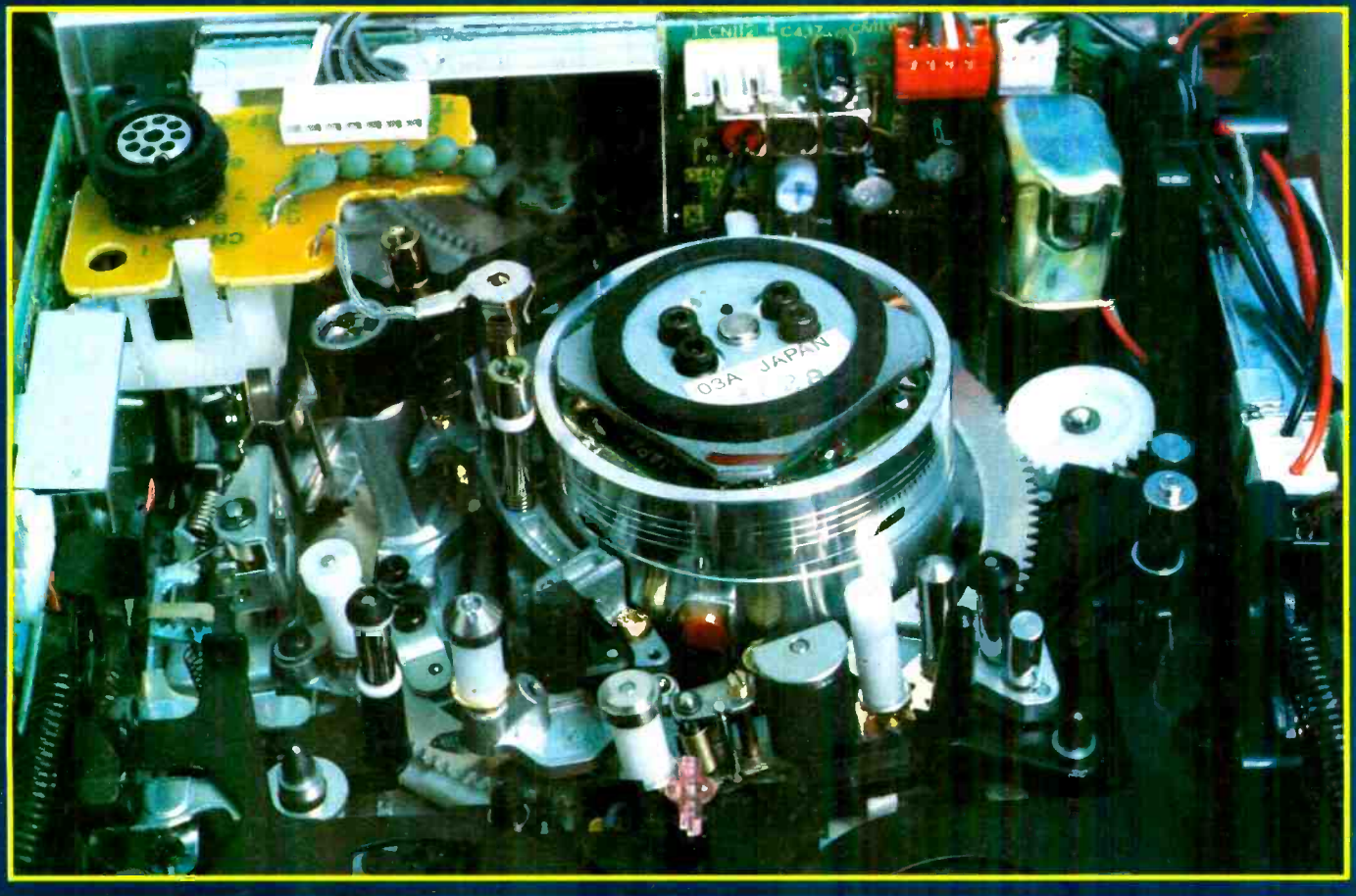
Australia $2.2C, New Zealand $2·95 (inc. GST), Malaysia $5·95 £1·30

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Extra this month –

TV/VCR Spares Guide



New Series:

The 8mm Video System

Dealing with Mains Interference

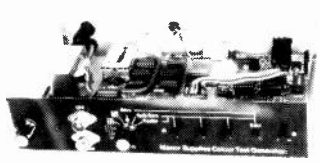
Test Report • DX-TV • CCTV Faults

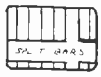
TV Fault Finding • VCR Clinic

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE





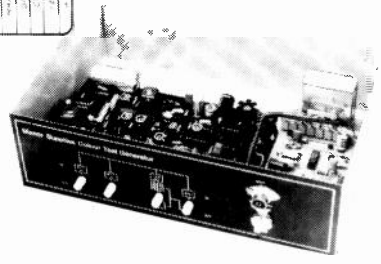
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ Chequerboard.
- ★ Mono outputs with border castellations, cross hatch, grey scale, vertical lines, horizontal lines and dots. UHF modulator output plugs straight into receiver aerial socket.
- ★ Additional video output for CCTV & VCR.
- ★ Facilities for sound output.
- ★ Easy to build kit, standard parts. Only 2 adjustments. No special test equipment required.
- ★ Mains operated with stabilised power supply.
- ★ All kits fully guaranteed with back-up service.
- ★ Also available with VHF Modulator.

Price of Kit	**£70.00**
Case (10″×6″×2¼″) app.	**£8.60**
Optional Sound Module (6MHz or 5.5MHz)	**£3.90**
Built & Tested in Case including Sound Module	**£108.00**

SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.80
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



- ★ Output at UHF, applied to receiver aerial socket.
- ★ In addition to colour bars R-Y, B-Y etc.
- ★ Cross-hatch, grey scale, peak white and black level.
- ★ Push button controls, battery or mains operated.
- ★ Simple design, only five i.c.s on colour bar P.C.B.

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. CASE £8.60. BATT HOLDERS £4.20. MAINS SUPPLY KIT £4.20 (Combined P&P £2.80).

MK 4 (BATTERY) BUILT & TESTED £58.00 + £2.80 P & P.
MK 4 (MAINS) BUILT & TESTED £68.00 + £2.80 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD VAT 15%

TELETEXT DECODER PANELS (TESTED)
Mullard VM6101 **£30.00**, Philips KT3, K30 **£30.00**, Texas XMH (TIFAX) **£28.00** (untested £5.00) p.p. £1.80

THORN TX9 MK2/3, TX10, teletext
Mullard Decorder panel + Interface **£35.00** p.p. £1.80
THORN TX10, PHILIPS G11 PRESTEL, TELETEXT
Mullard Units VM 6230, 6330 plus Line Coupler & Interface **£38.00** p.p. £2.50

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTs, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

SPECIAL OFFER Mullard/Philips quality UHF modulator (audio & video input) ex new equipment **£5.00** p.p. £1.00.
PHILIPS G11 6 position touch tune channel selector units **£16.00** p.p. £1.80 (can replace earlier mechanical selector unit).
PHILIPS G11 PANELS (tested).
Power, Frame, IF, decoder **£18.00** each p.p. £2.00. Scan **£28.00** p.p. £2.80.
PHILIPS G11 PANELS ex rental (untested).
Power, Scan **£10.00**, Frame, Decoder **£5.00** p.p. £2.00.
PHILIPS HANDSETS Ex rental, Teletext, Untested. KT3, K30, CTX, KT4, K35 etc. **£3.50** p.p. £1.00.
FERGUSON Video Manual 3V24 **£8.50** p.p. £2.00
COLOUR MANUALS p.p. 50p.
FERGUSON 9800 **£2.00.**
PHILIPS G11 **£3.50**, KT3 **£3.50**, CTX-E **£1.50**, CTX-S **£1.50.**
GRUNDIG incorp. GSC200, 1644GB, 1645GB, 4245GB, 4445GB, 6245GB, 6445GB + CUC95 **£2.00**
THORN REMOTE CONTROL HANDSETS
TX9 ULTRASONIC (3-button) **£15.00; TX9, TX10** Infra red (type 725) **£18.00; TX9, TX10** Infra red Teletext **£20.00**, p.p. £1.20.
THORN ex rental handsets untested 9600, TX9, TX10 **£5.00** p.p. £1.00.
TX9 Ultrasonic remote handset transducer **£2.00**, switches 3 for **£1.50** p.p. 50p.
TX9/TX10 Teletext interface panel (1524) **£5.00** p.p. 80p.

THORN TX9 Ultrasonic Remote/Control/Receiver panels. **£8.50** p.p. £1.50.
THORN TX10 Series Facia Control Panel with 8 position Channel Selector **£6.50** p.p. £1.50.
TX9, TX10 Facia control panel incl. infra-red remote receiver **£8.50** p.p. £1.80.
THORN TX9, TX10 Saw Filter IF Panel. **£5.00** p.p. 80p.
TX9, TX10 Remote & tuning control panel (1515) **£10.50** p.p. £1.80.
SAW FILTER IF AMPLIFIER PLUS TUNER complete and tested for T.V. Sound & Vision. **£28.50** p.p. £1.20.
PAL DECODER KIT (Video to RGB) for Monitors **£27.00** p.p. £1.00.
PAL ENCODER KIT (RGB to Video) **£18.50** p.p. £1.30.
CROSS HATCH UNIT KIT, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£12.00** p.p. 80p. (Alum. Case **£2.90** p.p. £1.40.) **ADDITIONAL GREY SCALE** Kit **£2.90** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £22.00 Alum. Case **£2.90.** De Luxe Case **£8.60** (Built & Tested **£48.00**) p.p. £2.30.
CRT TESTER & REACTIVATOR KIT For Colour & Mono complete with Case, Panel Meter Indicator – can be adapted for latest CRTs **£29.50** p.p. £2.80.
BUSH A823 Convergence, Time Base Panels **£5.00** each. p.p. £1.80.
GEC 2110 PANELS Sound **£2.50** (tested) p.p. 80p.
GEC 20AX Line Time Base **£18.00** p.p. £2.00.
THORN TX9 Panels ex factory for small spares. Includes I.Cs & Semiconductors etc. **£3.00** p.p. £1.80.
THORN TX9 Panels salvaged ex factory for spares incl. Electronic & Mains Transformers. **£8.50** p.p. £3.00.
THORN TX9 Panels ex factory salvaged complete cond. **£20.00** p.p. £3.00.
THORN 8000, 8500, 8800 IF Decoder Panels Tested **£10.00** p.p. £2.30.
THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
THORN 9000 IF/Decoder Panel **£6.00** p.p. £2.30.
THORN 9000 IF/Decoder Panels Salvaged. For spares **£2.50** p.p. £1.80.
THORN 9000 Frame Time Base **£8.50** p.p. £1.80.
PHILIPS G8/G9 IF/Decoder Panels for small spares incl ICs **£2.50** p.p. £1.60.
PHILIPS G8 Line Driver Panel incl. Equalizing Coil. **£1.00** p.p. 60p.
GRUNDIG 8630 Series Varicap Tuners **£5.00** p.p. £1.00.
U321 VARICAP £7.80 p.p. 80p. Makers Controls HITACHI 4 POSN **£9.50**, DECCA 4PSN **£5.80**, 6PSN **£6.80** p.p. 80p. etc.
BUSH "TOUCH TUNE" T20/22 Series Fascia Unit **£7.50** p.p. £1.50.
VARICAP UHF-VHF ELC 2000S **£9.80** p.p. £1.00.
UHF/625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50**, JAP Rotary **£4.80** p.p. £1.80.
TV SOUND IF Panels **£6.80** p.p. £1.00.
LOPTS New and guar. P/P **£1.50**, Bobbins **80p.**

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1590, 1591, 1612, 1613, 1712	£4.80
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THORN 1600, 1615, 1690, 1691	£9.15
THORN 3000/3500 SCAN, EHT	£6.90
THORN 8000, 8500, 8800	£12.80
THORN 9000 to 9600	£12.90
THORN TX9	£12.50
THORN TX10	£16.50
SPECIAL OFFER	
DECCA 1700, 2001, 2020, 2401, 2420	£3.80
GEC 2114J/Junior Fineline	£2.80
PHILIPS 320	£2.80
RBM A823	£4.80
GEC 2028, 2040, 2100	£4.80
PYE 691-7 chassis type only	£5.00
PYE 713, 715, PHILIPS 570, 571	£6.80
PHILIPS K9	£6.80
R.B.M. T20, T22	£9.80
R.B.M. T20, T22 Bobbin	£5.60
DECCA Bradford (state Mod No)	£8.80
DECCA 80, 100	£8.80
FIDELITY ZX2000, 3000	£16.00
GEC 2110 series	£10.60
ITT CVC 5 to 9, CVC20	£9.80
ITT CVC25, CVC30 series	£8.80
ITT CVC45	£9.80
PYE 725 (90°) 731 to 741	£9.20
PHILIPS G8	£8.80
PHILIPS G9	£10.80
PHILIPS G11	£18.50
PHILIPS KT3	£9.80
PHILIPS K30, K35	£18.50
PHILIPS CTX-E	£21.00
PHILIPS CTX-S	£21.00

OTHERS AVAILABLE, PRICES ON REQUEST.
TRIPLERS Full range available. Mono & Colour.
SPECIAL OFFER TRIPLERS
THORN 3000/3500 **£2.50, PYE** 725/731 (4 lead) **£1.50** p.p. £1.20.
THORN 1500 5 Stick **£1.50**, 1500 3 Stick **£1.50** p.p. 80p.
6·3V CRT Boost Transformers for Colour & Mono **£5.90** p.p. £1.40.
SPECIAL OFFER Thorn TX10 Focus Control **£5.50** p.p. £1.00.

CALLERS WELCOME AT SHOP PREMISES
THOUSANDS OF ADDITIONAL ITEMS, ENQUIRIES INVITED
LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS

Goods available if in stock immediately over shop counter (Mail order between 3 days and 1 week from receipt of order). ADD VAT 15%

Telephone 01-794 8751, 794 7346

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W. Hampstead Brit. Rail Stn. (Richmond, Dalston, Stratford, N. Woolwich)
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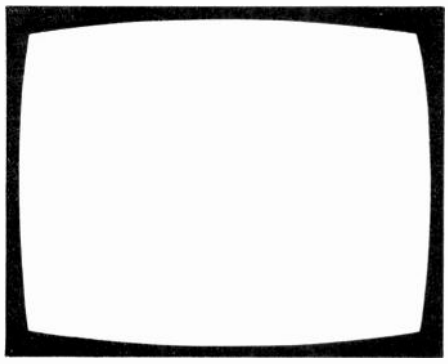
Access from all over Greater London.

Mail Order: 64 GOLDERS MANOR DRIVE, LONDON NW11 9HT
PLEASE ADD VAT 15% TO ALL PRICES INCL P+P



TELEVISION

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On sale March 18th

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

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BACK NUMBERS
Some back issues published during the last six months are available from the Editorial Office at £1·40 inclusive of postage and packing. Address as above.

QUERIES
We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. All correspondents expecting a reply should enclose a stamped addressed envelope.
Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to the address given above (see "correspondence").

this month

OUR NEXT ISSUE DATED MAY WILL BE PUBLISHED ON APRIL 15

P. V. TUBES

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Telex: 635562 Griffin G (For P.V.)

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ADD 87p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degausing coils please allow £1.50 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible. Add 15% VAT to total except where it states zero rate. Bulkier items will be sent by carrier £6.00 + VAT up to 20K (except tubes).

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BOOKS AND MANUALS ARE ZERO V.A.T.
Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service. V.A.T. invoice on request. Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice. In some cases we may have to supply an equivalent.

SEMICONDUCTORS

AC107	35
AC126	34
AC127	34
AC128	34
AC128K	40
AC141	62
AC141K	39
AC176	35
AC176K	35
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AC188	35
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AD161/62 MP	1.15
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AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	53
AF126	53
AF127	53
AF139	63
AF178	1.54
AF239	60
AF279	1.56
AL102	4.90
AU110	3.01
AU113	5.20
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BC108	20
BC109	20
BC114	12
BC115	17
BC116A	35
BC117	30
BC118	24
BC119	36
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BC140	32
BC141	30
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
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BC172	15
BC173	16
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BC177	27
BC178	26
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BC183L	15
BC184L	15
BC186	35
BC187	25
BC204	10
BC208	13
BC209	10
BC212	15
BC212L	15
BC213	15
BC214	15
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BC238	14
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BC252	12
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BC262	30
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BC303	33
BC307	20
BC308	25
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BC337	18
BC338	18
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BC548	13
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BC550	10
BC557	10
BC558	9
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BC637	39
BC639	30
BC640	32
BCY72	13
BD115	45
BD116A	90
BD124P	84
BD131	50
BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD160	1.60
BD166	52
BD179	70
BD182	1.20
BD183	1.18
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	82
BD233	66
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	69
BD508	80
BD509	86
BD510	86
BD278A	81
BD517	60
BD519	1.08
BD520	75
BD535	82
BD536	91
BD696A	1.49
BD697=701	1.63
BD698=702	1.50
BD701	1.63
BD707	1.50
BDX32	2.10
BF115	38
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BF198	18
BF199	21
BF200	35
BF224	40
BF225	20
BF241	38
BF256	60
BF257	34
BF258	34
BF259	34
BF262	84
BF263	81
BF271	24
BF273	24
BF274	24
BF336	40
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72
BF371	30
BF392	35
BF422	34
BF423	46
BF435 = BF491	35
BF457	35
BF458	43
BF459	58
BF460 = BF462	86
BF469	63
BF470	66
BF597	16
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	42
BFT43	42
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	32
BFY51	32
BFY52	32
BFY90	95
BR100	34
BR101	95
BR103	83
BR303	1.46
BRC4443	1.94
BRC4444	1.98
BRY39	56
BRY55	45
BRY56	57
BSV57B	89
BT100	1.65
BT101	1.20
BT106	1.60
BT108	1.69
BT109	1.31
BT116	1.87
BT119	3.66
BT120	3.66
BT151/800	2.07
BU104	2.00
BU126	1.75
BU204	1.50
BU205	1.87
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BUW81A	3.84
BU208/02	2.10
BU326A	2.00
BU407	1.70
BU426	3.07
BU500	2.50
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BU826	4.95
BUW84	1.45
BUX84	1.50
E1222	40
MEO411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	4.85
MR479	4.85
MR477	4.90
OT121	1.91
R2008B	1.90
R2010B	1.92
R2265	1.50
R2322	84
R2323	67
R2461	1.60
R2540	3.20
RC4558	2.20
RCA16334	90
RCA16029	1.18
RCA16039	1.18
RCA16092	1.18
RCA16040	96
RCA16041	84
RCA16334 =ON447	90
RCA16335 =ON448	90
RCA16957	2.88
TIC45	90
TIC46	60
TIC47	72
TIL32	65
TIL78	48
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP34B	1.06
TIP41C	47
TIP42C	50
TIP47	93
TIP120	65
TIP161	2.15
TIP2955	90
TIP3055	63
TIS91	32
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3055	79
2N3702	16
2N3703	16
2N3705	10
2N3706	10
2N3708	17
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.82
2SC1096	1.72
2SC1172Y	5.50
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC1986 =2SC1061	2.94
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
2SD870 (Sony)	6.35
DEC1	2.20
DEC2	2.20
THY15/80	2.40
THY15/85	2.40
Transistor mounting kit TO66, TO3, TO220AB	30

INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	6.37
AN262	4.10
AN301	5.15
AN715Q	3.97
AN6341N	8.97
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA1532	4.20
CA3065	1.80
HA1151	3.89
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1377	3.20
HA11219	4.21
HA11244	4.04
LA3350	1.59
LA4031P	3.21
LA4032P	3.15
LA4102	3.37
LA4112	3.25
LA4400	3.05
LA4422	3.28
LA4440	4.07
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
LM8361= MM5387ANN	4.15
MB3712	2.60
MC1307	1.99
MC1310P	1.84
MC1327	1.70
MC1330P	1.84
MC1351P	2.93
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1495L	3.00
ML231 ETTR6016	2.20
ML232	2.20
ML237	2.50
ML238	6.00
ML239	2.50
ML922	3.29
ML928	2.18
NSM5807	7.87
MS1513L	2.80
MS1515L	3.28
SAA1025	8.50
SAA1124	5.34
SAA1250	4.99
SAA5000	6.15
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAF1032	6.30
SAF1039	7.77
SAS560S	2.07
SAS570S	2.07
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	7.00
SL917B	9.25
SL1310	1.80
SL1327Q	1.20
SL1430	1.58
SL1432	3.36
SL76544	2.05
SL490	1.89
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.72
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35
SN76660N	80
SN76666N	1.52
SN76530A	1.47
STK015	7.36
STK032 = STK078	13.25
STK433	5.65
STK435	9.06
STK436	6.50
STK437	7.85
STK439	8.40
STK459	9.50
STK441	11.57
STK461=465	12.60
STK463	14.30
STK2129	13.20
STR441	6.50
STR451	6.50
STR6020	8.50
SW153	3.90
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	3.46
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	8.90
TA7172P	8.90
TA7173P	8.90
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	6.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA570	3.98
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TBA120SA	1.49
TBA120B	1.30
TBA120SB	1.37
TBA120T	1.47
TBA120U	1.49
TBA1440G	2.20
TBA395	1.75
TBA396	1.75
TBA440N (TBA1441)	2.75
TBA440P (TBA1440G)	2.50
TBA480Q	1.82
TBA510	3.00
TBA520(Q)	1.68
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TBA540	1.76
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TBA570	1.79
TBA690	1.50
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.62
TBA810AS	1.38
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.25
TBA970	4.09
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TCA900	2.20
TCA910	2.20
TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1006A	2.50
TDA1005	3.60
TDA1010	3.30
TDA1011	4.00
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1190P	3.50
TDA1180	2.91
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.50
TDA1415	1.40
TDA1470	4.67
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TDA2525	4.00
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TDA2610	3.20
TDA2611A	2.35
TDA2640	2.90
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TDA2680	3.40
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TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.66
TDA3562	8.60
TDA3571	3.75
TDA3651A	4.50
TDA3950	4.37
TDA4420	5.55
TDA4600	2.95
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TDA9503	4.21
TEA1009	1.86
UPC554	2.63
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UPC1156H	4.26
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UPC1163H	2.48
UPC1167C2	2.70
UPC1168C	3.20
UPC1176C	2.53
UPC1177H	3.15
UPC1178C	4.21
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
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UPC1186H	1.60
UPC1188H	4.99
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UPC1200V	1.18
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UPC1216V	1.20
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UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	4.39
UPC1238	2.50
UPC1245V	1.35
UPC1277	4.81
UPC1350C	4.15
UPC1353C	4.76
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.00
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
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UPC41C	2.80
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2732	3.30
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4116	1.10
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4164	1.60
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ZTX313	27
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7808	78
7812	78
7815	78
7818	78
7824	78
78L05	68
78L08	68
78L12	68
78L24	68
7905	98
7906	98
7908	98
7912	98
7915	98
7918	98
7924	98
79L05	72
79L12	72
79L15	72
79L24	72

DIODES

BA102	25
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA157	20
BA318	26
BAX13	4
BAX16	8
BB105G	30
BY122	96
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY229	1.06
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX55/600	30
BYX71/600	90
BY224	2.00
OA47	20
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	10
IN4007	10
IN4148	5
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	20
BY225	37
General Purpose Triac	95
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BZV15 C12/C24	1.24
BZX61 130V	28
BZX61 Range (1.3W)	20
BZX79 Range (400mV)	10
BZY88 Range (400mV)	10
BZY93, 90 (18V)	1.18

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6510 CPU	5.66
6526 CIA Keyboard Int.	5.11
6561	7.74
6569 Col. Vid. Cont.	20.77
6581 Sound Gen.	7.79
901225 Char. ROM	3.37
901226 Basic ROM	6.45
901227 Kernel ROM	3.52
906114 PLA	4.51
4164 RAM	1.60
Timer	84
8701 Clock Chip	5.46

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Commodore PSU	19.95
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DATA BOOKS (Zero VAT)

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LIN IC Books (data only not Equiv.) LINI	5.95
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TDV1 Trans. Data Dictionary	7.50

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V11N	KV1810UB	1.27
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SG-264A		5.12
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SG-6533	SG613	13.20
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CX143A	SLC5/7UB	9.23
CX186	SLC5UB	6.57
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TL494CN	SLC7UB	6.57
2SA 771		3.04
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2SA 1175	SLC7UB	40
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2SB 740C		1.24
2SB 856		1.84
2SC 403C		32
2SC 867A		3.07
2SC 1034		6.57
2SC 1061 = 2SC1986		3.07
2SC 1114		6.57
2SC 1124		1.27
2SC 1316		8.05
2SC 1362-7		43
2SC 1364		43
2SC 1413A		9.23
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2SC 2335 Kit		11.18
2SC 2369		4.14
2SC 2551		1.27
2SC 2785		43
2SC 3153		5.12
2SD 257		3.04
2SD 725		11.18
2SD 773		32
2SD 774		1.24
2SD 1164		1.27
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UHF Tuner BT-871	KV1810UB	48.36
Booster Antenna	SLC7UB	40.79
RF Modulator	SLC6UB	68.30

SONY REMOTE CONTROLS

SLC5UB RM751 (Wired)	29.04
SLC6UB RM-72 (Wired)	22.62
SLC7UB RMT200 (IR)	42.60

SONY SPARES VIDEO/AUDIO HEADS

Ace Assembly	SLC7UB	31.33
Ace Assembly	SLC6UB SYA-676-104-6A rep	49.39
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Video Head DSR-36R	SLC5/C6/7UB	49.39
Video Head DSR-43A	SL8000UB	49.39
Head Record-Playback	PP128-3602C/ GEN	17.27
Head Record-Playback	181-3602D TC/HMK	5.35

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Main Drum Assy	SLC7UB	192.52
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Rewind Idler Assey	SLC6UB	4.14
Forward Assy	SLC6UB	4.14
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Pinch Roller	TC204SD	1.84
Pinch Roller	HMK44/44B	1.24
Pinch Roller	TCK55	1.24
Cass Holder Assy	TCK44	1.84
Lever Fwd. Assy	WM2	1.24
F.Wheel Assy	WM2	4.13
Limiter Assy	SLC7UB	3.07
Idler Assy	SLC7UB/C5/3000	1.27
Brake Assy	SLC7UB	1.82
Pulley Load Assy	SLC6UB	1.27
Thrust Bear. Assy	SLC6UB	4.13
Screw Cass. Lid	WM2	32
Coil Spring	WM2	32
Battery Lid	WM2	1.27
Lid Timer	SLC7UB	1.27
Threading Gear	SLT6ME	1.27
C5 C7 Capstan Motor		44.20
C7 Drive Motor		42.89
Pinch Roller	SLC7UB	0.96

SONY SPARES BELTS

Belt	WMR2	1.27
Rubber Belt	TC-GEN	1.27
Take Up	TC-GEN	1.27
Drive	TC-GEN	1.27
Midway Pull	TC-GEN	1.27
Capstan	TC92	1.27
Capstan	TC135/136SD	1.27
Flat New	TC186SD	1.27
Capstan	TC-GEN	1.27
Capstan	HST300	1.27
Take Up	HMK3000UK	1.27
Capstan	HMK3000UK etc	1.27
Fast Fwd-Rwnd	V02850P	3.07
Forward	V02850P	1.82
Motor	V02850P	3.07
Capstan	VP2000	5.61
Forward	SLC7UB/SLC5UB	43
Capstan	SL8000UB	1.27
Extension	SL8000UB	3.07
Orum	SL8000UB	1.82
Fast Fwd Idler	SLC7UB	1.27
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Capstan	SLC7UB/CS	1.27
Eject	SLC7UB	1.27
Counter	SLC7UB	43
Fast Forward	SLT7ME	1.27
Forward	SL8000UB	1.27
Belt	SLC6UB	1.27
Fast Forward	SLC6UB	1.27
Counter	SLC6UB	1.27
Threading	SLC6UB	1.27
Relay	SLC6UB	1.27
Capstan	SLC6UB	1.82
Belt	PS-5520 etc	3.18

SONY SPARES SWITCHES

Sw.(Sfce wave) Filter	KV2022UB	1.27
PB Switch Channel	1820/2 & 1340	18.85
PB Power	KV-GEN	3.07
PB Switch	SL8000UB	1.27
PB Power	KV14/2060UB	4.14
Sw. Power	KV2022UB	5.12
Sw. Slide Record	SL8000UB	1.27
Sw. Slide Rec/pback	SL8000UB	1.82
Sw. On/Off	KV1612UB	5.12
Sw. Power	KV-GEN	5.12
Button Stop/Eject	WM4	1.27
Control Knob	SLC7UB	1.27

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Instruction Manuals	
SLC9UB	4.14
SLC6UB Mk 2	2.47
SLC7UB	4.14
SLC5UB	6.84
SL6UB	1.72
KV2212UB/E2	1.72
KV2705UB	1.72
Service Manuals	
HMK3000	8.25
KV1400UB	8.25
SLC7UB	9.23
SLC5UB	9.23
SLC6UB	9.23
SLC9UB	9.23
SLC6UB Mk 2	9.23

PHILIPS – CTX

CTX EHT Leads	7.36

PHILIPS – KT3

116 40025	Dual Posistor	1.80
124 70347	Main Electrolytic	6.50
101 20519	Focus Control	3.68
140 10161	LOPT Tripler	10.06 12.50
276 80198	Select Unit 933	16.67
276 10673	On/Off Switch	3.84
Panels		
212 20648	Lum. Chroma mk.1	31.09
212 37538	Lum. Chroma mk.2	19.80
212 20616	RGB Panel	12.87
212 20647	Sound Panel	12.50
212 21114	Power Panel	21.48
212 20617 21164	Line Frame Sync	26.49
212 20649	Mains Input Rect. Panel	17.96
212 27445 212 27522	I.F. Module(V321)	16.60
212 20646	I.F. Module(2003)	18.63

PHILIPS K30

101 20561	Focus Unit EHT Lead	3.68 8.30
140 10283	LOPT	17.94
276 17083	On/Off Sw.	2.60
276 10781		
310 27455	Prog. Select 1002 late 1002 early	13.10
All Gun Switches		70
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212 27593	Euro Decoder K30/35 Sound	46.00 12.50
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GL4850	TX10	74
TIC45	TX9	1.18
T9022W	TX9	43
T9053/4	TX9	1.10
AN6360	3V29	6.81
HA11741	3V32	23.22
M293	TX90	7.10
M50790SP	3V35	6.98
M54544L	3V32	3.80
MC13002		4.98
MC14493	TX9/TX10	8.97
MN1219	3V36	11.43
TDA1236	TX10	3.44
TDA3652	TX10	6.00
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DTC144WF	3V35	30
R2540	9000	3.20
TIP112H	TX90	69
T5051V	TX9	3.43
T6069V	TX9	38
T6071	TX100	1.46
T9063V	TX9	4.70
19064V	TX90	1.14
UPD553C 164	3V29	20.76
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10 Volt T05	3V29	8.74

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Service Manual	1690/1691	5.60
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Service Manual	9600	10.05
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Instruction Manual	3V29	3.28
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Supplement to	3V35/8 3V39	90
Service Manual	3V42	23.94
Service Manual	3V43	30.72

THORN BELTS/LAMPS

Counter Belt 1	3292/3V00/3V16/3V22	60
Counter Belt 2	3292/3V00/3V16/3V22	60
Reel Drive Belt	3292/3V00/3V16/3V22	1.00
Relay Belt	3V00	2.79
Capstan Belt	3292/3V00/3V01/3V16/3V22	3.28
Unloading Belt	3292/3V00/3V16/3V22	60
Drum Motor Belt	3292/3V00/3V16/3V22	2.79
Cassette Drive Belt	3V23	60
Capstan Belt	3V29/3V30	1.62
Loading Belt	3V23	60
Loading Belt	3V29/3V30	60
Loading Belt	3V35/3V36/3V38	60
Tape Spool Drive	3V35/3V36/3V38	60
Take Up Clutch	3V29/3V30/3V35/3V36/3V38	60
Capstan Belt	3V35/3V36/3V38	1.21

THORN LAMPS

Tuning Indic Lamp	TX9	62
Cassette Lamp	3292/3V00	3.66
Cassette Lamp	3V16	1.53
Lamp Holder	3V16	60
Cassette Lamp	3V23	1.95
Lamp Holder	3V29-3V30/3V31/3V32	60
Cassette Lamp	3V29-3V30	1.41
Cassette Lamp	3V31-3V32	1.60

THORN VIDEO HEADS

Upper Drum Assy	3292-3V00	35.94
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Thorn 8500 Focus Unit	4.75
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470K Line Control	59

V.C.R. MOTORS

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Drum Motor	3292/3V00/3V01/3V16/3V22	43.49
SMP Reel Motor	3V23	32.79
Cassette Housing Motor Assembly	3V23	10.32
Capstan Motord	3V23	52.81
Loading Motor	3V23/3V24/3V29/3V30	8.56
Capstan Motor	3V29/3V30	27.32
Reel Motor	3V29/3V30	32.79
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Capstan Motor	3V35/3V36/3V38	27.93

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T725 Non Text/	TX9 20A2/2282/3781/37081/ 37101/3714/37351/37361/ 37371	19.40
T731 Text/ Stereo	TX9 20A4/22B4/37063/37093/ 10 37463/37371	20.01
T736 Text	100 20A3/2203/3795/3796/ 37003/37103/37353/37363/ 37373/37953/37963	31.60

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On/Off Switch	TX9	4.90
On/Off Switch	TX10	2.74
Focus Unit	TX10	10.20
8 Way Tuner Unit (Not Drawer)	37141 TX90	12.88
8 Way Tuner Unit (Not Drawer)	37360 TX9	13.50
8 Way Tuner Unit (Not Drawer)	37340/37370 TX9	20.44
Volume Control	38030 1790	1.74
6 Way PB Assy	3722/4722/ 6722/8000 Thorn 9000	20.70

THORN TRANSFORMERS & INDUCTORS

LOPT	9000	25.53
FHT Transformer	TX10	33.80
LOPT	TX10	15.00
LOPT	TX9	23.85
RFI Choke	TX9	3.45
DC Input Choke	TX9	15.36
Mains Transformer	TX90	15.03
Linear Line Coil	TX9	1.77
RFI Input Choke	TX9	60

THORN MECH. REP. VCR

Take Up Rubber Tyre	3V92/3V00	60
Rewind Tyre	3V92/3V00	60
Timing Gear Assembly	3V00	3.97
Audio Control Head Sub Assembly	3V92/3V00/3V01/3V16/ 3V22	42.38
Fast Forward Idler	3292/3V00/3V16	1.63
Fast Forward Tyre	3V00/3V16	60
Pinch Roller	3V92/3V00/3V01/3V16/ 3V22/3V23	7.30
Stop Solenoid	3V16	10.42
Pause Solenoid	3V16	16.60
Take Up Idler Assmb	3V00 up to Serial No. 19006 3V16 up to Serial No. 16509 3V22 up to Serial No. 27700	7.54
Take Up Idler Assmb	3V00 19007 onwds 3V16 16510 onwds 3V22 27701 onwds	5.28
Rewind Idler	3V16	8.52
Take Up Tension Brkt	3V23	80
Roller Assembly	3V23	4.08
Take Up Spool Idler Assmb	3V29/3V30	2.12
Pinch Roller	3V29/3V30	8.66
Idler Counter Pulley	3V29/3V30	60
Cassette Housing Assmb	3V29/3V30	20.85
Take Up Clutch Assmb	3V29/3V30	2.36
Spool Carrier Idler Assmb	3V35/3V36/3V38	2.73
Cass. Housing Assy	3V35/3V36	36.74
Lower Door Spring	3V35	60
IF Panels	TX10	23.52
Cassette Cover	3V29/3V30	4.34
TX90 Battery Inverter	TA127	£37.81

TUNERS/MIXERS

Mix Booster	3292	30.62
Mix Booster	3V29	24.70
RF Convertor	3V29	59.32
Mix Booster	3V31/3V32	24.50
UHF Tuner	3V35/3V36	38.12
RF Convertor	3V35/3V36/3V38	36.08
UHF Tuner	3V39	21.87
Varicap Tuner	TX9/TX10	16.34

PHILIPS – G11 Sundries

47 pot with switch	85
Line Lin Coil	3.80
62 pot RGB	6.75
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Power Panel	41.06
Timebase Panel	37.50
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Final Anode Lead	3.20
Focus Unit	6.80
39R Resistor	70
RGB 10G Diode	69
IF Panel with V321	12.00

PHILIPS – G8 Sundries

Knobs sm. or lg.	50
Rear Convergce Panel	23.00
AFC Unit	8.82

PHILIPS – Video Heads/Tape

Philips	V2000 Head	64.00
	1700 Head	64.00
LVC1700	Tape 120	17.50
VCC360	Scotch	6.33
VCC480	Scotch	7.23

PHILIPS – Manuals (Zero VAT)

Philips	G9	4.20
	K30	3.90
	KT3	3.90

PYE

IF Gain Module	9.00
CDA Panel	20.00
731 RF Choke	6.50

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STR454	4.73
SN76709	8.00
TDA1870	6.46
TDA4503	5.68
2SD1453	2.20

HITACHI/GEC – VCR GEC V4000H/ Hitachi 8000

Belt Counter (122)	47
Belt Loading	43
Belt Take Up	30
Idler FF/Rewind	1.87
Lamp Tape Sensor	65
Play Idler Assy V6414221	3.74
Pressure Pinch Roller	5.16
Pulley FF/Rewind V6383531	52
Relay	2.54
Upper Cylinder (Head)	35.62

HITACHI/GEC – VCR GEC V40001H/ V4002/Hitachi 9300/9500E

Belt (259)	47
Belt (289)	47
Belt Take Up (213)	30
Capstan Motor	31.00
Idler FF/Rewind	1.80
Lamp Tape Sensor	91
Play Idler Assy VS861482	3.72
Pulley FF/Rewind V6345173	36
Video Head	35.62
Remote Cont. Handset	9.33

HITACHI/GEC – VCR GEC V4004/ Hit.VT33E

Belt (302)	30
FF/Rewind Arm V6886971	2.90

HITACHI/GEC – VCR GEC V4100/ Hitachi VT11E

Belt 312	30
Belt 313	30
Belt 317	47
Belt 318	40
Capstan Motor	22.18
Upper Cylinder (Head)	33.35

HITACHI – Sundries

Vertical Output Module GECC2286, Hit. CPT2226 C2067 C2069	3.98

HITACHI/GEC – Service Manuals (Zero VAT)

GEC	Hitachi	
V4000H	8000	6.49
V4004	VT33E	7.18
V4005E	VT63	4.77
V4100	VT11E	6.49

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TDA3330	2.21
TDA8180	4.00
BC638	33
BU5080	1.77
TDA3810	3.86

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On/Off Remote Cont.	2.43
On/Off CTV 140	94

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Flyback FCC2015BE up to 22"	12.00
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Mod. Kit included	

FIDELITY – Remote Controls

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12 Button IS500	13.81
14 Button AVS	12.75
32 Button Teletext	15.90
Tuner Flap CTV 14S	83
Loudspeaker CM14/CTV140R	1.99

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Audio	IS500	2.20
	IS700	2.20
	IS750	2.20
TV	CM14	2.20
	CTM1400	2.20
	F14R	2.20
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ZX3000TV	AVS1600	1.70
ZX3000TV	CTV20	2.20
ZX3000TV	Teletext	2.20
VCR 2 Parts VCR		3.90

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PYE 725/31 3R/56R/27R	1.84
PYE 725 56R/27R	1.04
Philips 5050 30R/125R	1.75
Philips 5051 118/14B	1.93
Philips G8 47R	72
Philips G8 2R7/68R	1.38
Thorn 1400	1.52
Thorn 1500	1.47
Thorn 3500	1.20
Thorn 8000A	1.24
Thorn 8500	1.36
Decca 2R5	96
Decca Modulohm 3R9	60

PLUGS AND SOCKETS

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5 pin 180°/240°/360°	20
6 pin	28
7 pin	35
8 pin	56
Chassis Sockets DIN	**Line Sock.**
5 pin din 180°/240°360°	28 28
6 pin din	36 28
7 pin din	36 30
8 pin din	64 55
Phono plugs	12
2.5mm Jack plugs	11
3.5mm Jack plugs	15
3.5mm Jack Plugs Stereo	35
6.3mm Jack Plugs Stereo	36
Standard mono jack plugs	20
2 pin speaker plugs	10
I.D.C. plugs 36 way conn.	5.90
BNC plugs	1.15
Car aerial plugs	18
FM plugs	25
Coax plugs metal	18
Line connectors	16
Female plugs	75
In line socket metal	52
Crocodile Clips	25
Phono line socket	20
Phono chassis socket	10
2.5mm jack line socket	17
2.5mm jack chassis socket	14
3.5mm jack line socket	18
3.5mm jack chassis socket	24
3.5mm stereo line jack socket	28
3.5mm stereo jack chassis socket	18
6.3mm stereo jack socket	25
IDC 36 way socket	6.90
PL259 with reducer	1.30
Reducers for PL259	16

ADAPTORS

3.5mm Plug/6.3mm Soc.	25
3.5mm Plug/2.5mm Soc.	25

LEADS

2mm Fly m/m	70
2mm Fly m/f	70
4m Fly m/m	1.20
10m Fly	1.90
Fig. 8 Mains	62
Computer/TV	97
5 pin din/5 pin din	98
5 pin din/7 pin din	98
TA81 car bat. Thom 1691	4.47
TA51 car bat. Thom 1615	3.66
Car battery Philips	3.95
Scart Leads 2m (open end)	3.50

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CAPLESS LAMPS	**28p**
WIRE NEONS	**9p**
TUBULAR LAMPS CAPPED	**31p**
TUBULAR LAMPS (Wire ended)	**31p**
WIRE ENDED LAMPS	**31p**

AUDIO HEADS

Mono record/playback	4.32
Stereo playback	4.79
Stereo record/playback	4.99
Stereo record/playback (Dolby)	6.90
Mono/stereo erase	2.25

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6V MD6515	4.95
9V MD9516	4.95
12V MD12517	4.95

ANTEX

C15W Iron 240V	6.20
C240 Element	2.75
Bits 102, 106, 820, 821	1.10
CS17W Iron 240V	6.40
CS240 Element	2.75
Bits 1100, 1101, 1106	1.10
XS25W Iron 240V	6.50
XS240 Element	2.75
Bits 50, 51	1.10
Temp. Controlled	
30W Iron CSTC	16.95
40W Iron XSTC	16.95
Unit TCSU1	68.95
Antex Stand	2.10
MLXS Auto Rep. Kit	8.40
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Cordless Gas Iron	15.99
Tips for Gas Iron	5.00
25 Watt Philips	5.50

WELLER

Heat gun	15.95
Heat gun tips	83
3/16" Iron tips 25W	83

SERVISOL

Freeze-It	1.20
SUPER SERVISOL	1.04
Foam Cleanser	1.02
Plastics Seal	1.14
Silicone Grease	1.30
Tubes Silicone Grease	1.66
Aero Klene	94
Aero Duster	1.28
Excel Polish	96
Video Head Cleanser	90
Super 40	1.66
Fire Extinguisher 640G	3.08
Heat Sink Compound 25G	1.10
Solda Mop standard reel	77
Hylosil Silicone Rubber	2.98

SECURITY EQUIPMENT

	CONTROL PANELS	
NEW	1011 Hilclare	29.50
NEW	Hilclare Zone Exp.	32.50
	BELLS/BOXES	
→	"C" Type Dummy	3.25
	"C" Type Polyprop.	4.55
	"C" Type Translux.	7.80
	6" MO Bell	5.52
	CABLE	
NEW	4 Core	5.43
	6 Core	7.84
→	8 Core	10.37
	INFRA-RED PASSIVE	
	6JD Mini	26.15
	Invader	24.00
	SECURITY LIGHTS	
NEW	Floodlights	17.74
	Infrascan	62.94
	S.A.B. MODULES	
→	Castle SAB	13.49
	P.A. BUTTONS	
	Stainless	2.88
	CONTACTS	
NEW	5 Term Flush M	59
NEW	5 Term Surface M	59
	4 Wire Flush M	62
→	4 Wire Surface M	62
	RECHARG. BATTERIES	
	12V 1.9A	7.06
	EXTERNAL SOUNDERS	
	712 Ext. Siren 116dB	5.75
	1010 Ext. Siren 116dB	5.96
	Dinablast 127dB	18.14
	PIEZO SOUNDERS	
	SB1 (140dB)	3.37
	SB2 (111dB)	5.17
	PZ28 (105dB)	4.61
	BUZZERS	
	HB722	60
	TAMPER SWITCHES	
	2½ Tamper	50
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	Fused Spur	2.58
	XENON FLASHER	
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	6 Way	21
	8 way	39
	CABLE CLIPS	
	3.5m 100	98
	4.5m 100	1.08

CASSETTE DRIVE BELTS

35mm	35	46mm	37
57mm	37	66mm	39
71mm	43	90mm	43
101mm	59		

EVER READY BATTERIES

HP2/R20	
LR20 Gold	82
R20S Silver	39
R20B Blue	27
RX20 Rechargeable	2.61
HP11/R14	
LR14 Gold	74
R14S Silver	33
R14B Blue	24
RX14 Rechargeable	2.31
HP7/R6	
LR6(BC4) Gold	41
LR6(BC2) Gold	43
R6S Silver	21
R6B Blue	15
RX6 Rechargeable	1.31
PP3/6F22	
6LF22 Gold	1.53
PP3S Silver	74
PP3B Blue	54
RX22 Rechargeable	4.89
HP16/RO3	
LR03 Gold	41
Blue	18
No.8 Battery	30
Univ. Batt. Charger	7.50
5 Hour Chg.	9.18

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SANYO	VTC9300/VBS7000	4.35
SONY	C7/J7/SL17	4.35
JVC	TCE3V00/01/06/16/ 23/24	
JVC	HR2200/3320/3330/ 3660/1100/7700	
AKAI	VS9700	4.35
HITACHI	VT5000	4.35
SHARP	VC6300/6500	4.35

VIDEO BELT KITS

VEKIT 1	AKAI JVC HR3300/HR3320/ HR3330/HR3360 TCE	VS9300/VS9500/VS9800 8903/3V00/3V16/3V22	3.50
VEKIT 2	PANASONIC	NV7000B/NV7200B	3.00
VEKIT 3	SONY	SLC5/7	3.75
VEKIT 4	SONY	SL8000/8500/8600	4.50
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VEKIT 6	PANASONIC	NV3000B	3.00
VEKIT 7	SANYO	9300P	4.25
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VEKIT 9	PANASONIC	NV8600B/8610/V011	4.25
VEKIT 10	TOSHIBA	V8600	3.00
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VEKIT 12	SHARP	VC6300/6600	4.00
VEKIT 13	SANYO	VTC5000	1.95
VEKIT 14	SANYO	VTC5300	2.50
VEKIT 15	JVC	HR7650	2.50
VEKIT 17	SHARP	8300	1.76
VEKIT 18	SHARP	9300	1.47
VEKIT 19	HITACHI	VT8000	1.12
VEKIT 20	HITACHI	VT11/33	2.15
VEKIT 21	HITACHI	9500	1.12

VIDEO IDLER TYRES

	O.Dia	I.Dia	Width	
SONY	23.7	17.4	4.9	50p
SONY	24.2	18	5.1	50p
HITACHI	31.8	25	4.9	50p
HITACHI	39.5	30	4.2	52p
PANASONIC	37	27	3.9	52p
PANASONIC	34.5	27	3.1	50p
AKAI	26	20	3.9	50p
JVC	32.8	3.4	3.9	56p
JVC	23.9	4.8	4	56p

VIDEO HEADS

Thorn New Life Heads (exchange)	21.45
3HSS	30.00
4HSS	31.00
PS3B Sony/Beta	35.00
Philips V2000	64.00
Philips 1700	64.00
Sanyo 9300/9455/9500	53.00
Sanyo 5000/5300/5400	53.00
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Toshiba 9600 (Rep. type only)	37.00
Sharp 2300	58.00
Sharp 6300	58.00
Sharp 7300/7700/7750	58.00
Sharp 8300	58.00
Sharp 3300/9700	56.00
Sharp 3HSS (S.P.)	42.00
Hitachi HIVI	35.62
Hitachi VT33E/GEC 4004	35.62
Hitachi VT11/GEC 4100	35.62

VIDEO TAPES

SKC	E60	2.50
	E120	2.88
	E180	2.80
	E240	3.78
	L500	2.90
	L750	3.40
Scotch	E30	3.66
	E60	4.00
	E120	3.24
	E180	3.86
	L750	5.22
	VCC360	6.33
	VCC480	7.23
Philips	LVC 1700 120	17.50

VIDEO SUNDRIES

VHS Drum Motor	25.50
VHS Capstan Motor	25.50
Sanyo 5000 Reel Motor	12.95
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Take up idler Ass./Clutch Ass.	
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Sanyo	6.95
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Video Lamps	
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3V23 with plug VHS	1.95
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Care Kit Deluxe	5.00
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Head Cleaner	90
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TB42 Thorens	1.20
TB23 Philips	1.20
TB50 Garrard	1.20
TB70 Hitachi	1.20
TB60 Sanyo	1.20
TB01 Pan., Sony, Pioneer, Technics, Sansui	1.20
TB03 BSR	1.20

REMOTE HANDSETS

PHILIPS

IR8331 KT3/K30 Mon. Text IR	15.85
IR8420 KT3/K30 Text IR	16.70
IR8435 G11 8 Way Text IR	20.85
OS8263 G11 Mon Text US	19.50
TP8431 G11 Mon Text US	19.50
US8518 G11 2 Function US	18.75
691, 17181 G11 31 Button US	27.00
Philips Remote 218, 20578 KT3 K30 K35 KT4 KT40 (Non Text or Text)	25.00

DECCA

VS8513 101 Mon. Text US	20.85
OS8511 80/100 3 Func. US	19.50

J.V.C.

RTP843 Text IR	13.50
Remote Control Tester	29.94

THORN

T723 (TMMA, 824, 004) TX10 Mon. Text Gen. Thorn	38.60
T723 IR8442 TX10 Mon. Text Rep. Type	19.50
T725 (TMMA, 860, 004) TX9 Mon. Text	19.40
T725 IR8688 TX9 Mon. Text Rep. Type	23.00
T731 (TMMA, 904, 004) TX9/10/100 Text Ster. Gen. Thorn	20.01
T736 (TMMA, 486, 004) TX9/10/100 Text Gen. Thorn	31.60
T736 IR8864 TX9/10/100 Text Rep Type	23.85

GRUNDIG

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RTP05 Telepilot 8	13.50
RTP06 Telepilot 160	13.50
RTP07 Telepilot 300	13.50

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Philips KT3/30 1. without Text	8.95
2. with Text	8.95

VARICAP TUNERS

ELC1043-05	8.40
ELC104305 Mullard	12.50
ELC1043-06	8.40
ELC2003	19.50
Philips G8/G9	10.50
Philips G11 (U321)	9.90
U322	7.20
U341	9.50
U342	8.50

PUSH BUTTON ASS.

Hitachi 4 way	12.36
Philips G8 (early)	17.82
Philips G8 (late)	18.97
Philips G11 Tip Switch unit	26.50
Philips KT3	16.67
Philips KT30	13.22
Pye 6 way (207/715)	18.40
Pye 697 repair kit	10.35
Pye 725-735 (also Red Mk.1)	12.60
Pye 725-735 tuning head with PCB	12.50
Decca 4 way	7.93
Decca 6 way	9.17
Decca 4/6 way conversion kit	17.50
Decca 7 way piano key rep. kit	15.62
GEC 2110 6 way	10.92
GEC 6 way slim	10.29
GEC/ITT/PYE 7 way	16.67
GEC Conversion kit	16.50
Rank A823	12.36
Rank T20A	11.21
ITT CVC 8/9 (mod)	13.80
ITT 6 way with VCR	8.90
Thorn 8500	6.50
GEC 7 B/P c neons	10.50

SWITCHES/ACCESSORIES

On/off gen. purpose 4A	80
G8 on/off metal or plastic	1.98
G11 on/off	1.58
G11 on/off remote	1.58
Rotary on/off gen. purpose	66
ITT CVC5 on/off	1.24
ITT mains switch wity solenoid	4.50
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Rank mains switch with solenoid	4.50
Thorn TX9/10	2.98
Thorn 9/10	2.Tx 98
GEC 2040 on/off	98
Rank tuner buttons 3 sizes	20
Thorn 3500 A1 beam switch	86
GEC 2110 tuner neons	35
GEC 2110 A1 cont. R/B/G	58

POTENTIOMETERS

Midget controls, Insulated Spindle. Length 44mm Log. or Lin Without Switch. 5K, 10K, 25K, 50K, 100K, 250K, 500K, 1M 54

DPST Switched log. 5K, 10K, 25K, 50K, 100K, 250K, 500K, 1M, 2M 1.26

Dual Gang Controls 1.25
16mm Rotary Controls 10K, 22K, 100K, 1M 1.25

Convergence Pots. 60
3W Stand
5R, 6R8, 10R, 20R, 50R, 100R, 200R, 500R

Metric/Philips Type 60
5R, 10R, 15R, 20R, 50R

Skeleton Presets 16
Stand. or miniature. Horiz. or Vert. 100R-2M2

Slider Potentiometers Lin. or Log 75
1K, 2K2, 10K, 47K, 470K, 100K, 4K7 Log.

Multiturn Pots 65
GEC/TCE 100K, Philips G8, Decca/Rank

Thermal Cut Out Switches

Thorn 3000 2A Metal	2.68
GEC 2040 Metal	2.50

CAPACITORS
Main Replacement Electrolytic

Pye 169 (200/200/100/32)	3.74
Pye 691/7 (200/300/350V)	2.97
Philips G8 (600/300V)	2.53
Philips G9 (600/300V)	2.44
Philips G11 (470/250V)	3.19
Philips G11 (7n5 1500V)	1.40
Philips 320 (400/400/200V)	3.02
Decca 30 (400/400/350V)	3.74
Decca 80 (400/350V)	4.37
RBM A823 (2500/2500/30V)	1.83
RBM A823 (600/300V)	3.12
RR1 T20A (220/400V)	2.20
ITT CVC 5/9 (200/200/75/25)	3.28
ITT CVC 20 (220/400V)	2.20
GEC 200/200/150/150	2.91
Thorn 1500V (150/150/100/300V)	2.42
Thorn 1500V (12/300V)	35
Thorn 1591/1691 4700/25V	1.32
Thorn 3500 (400/40V)	33
Thorn 3500 (175/100/100/400/350V)	3.06
Thorn 3500 (1000/63V)	95
Thorn 3500 (1000/70V)	95
Thorn 8000/8500 (2500/2500/63V)	3.72
Thorn 8000/8500 (700/250V)	2.55
Thorn 8000/8500 (400/350V)	2.82
Thorn 9000 (400/400V)	3.61

LINE OUTPUT TRANS.

Philips 210/300 Mono	10.00
Philips G8	8.75
Philips G9	9.50
Philips KT3	10.06
Philips K30	17.94
Philips TX2	13.39
Philips TX3	14.41
Philips G11	15.58
Pye 713/715	10.00
Pye 725 90°	10.50
Pye 169	10.00
Pye 741	9.90
Bang & Olufson (2000,3000)	14.69
DECCA 80	8.58
Decca 100	8.58
Decca 1700	9.00
Decca 1730	8.58
Decca 2230	8.58
GEC 2110	16.75
GEC 2040	9.50
ITT CVC 1/9	10.85
ITT CVC 25/30/32	8.65
ITT CVC 20	8.60
ITT CVC 45	8.60
R.B.M. T20	13.95
R.B.M. BUSHRANGER T16A	10.00
R.B.M. BUSHRANGER T18A	10.00
Thorn 3000 EHT	9.95
Thorn 3000 SCAN	7.95
Thorn 8500	17.50
Thorn 3000/3500 Mains	10.00
Thorn 1615	12.50
Thorn 1691	9.68
Thorn TX9	23.85
Thorn 9600	21.79

RECTIFIER TRAYS

Thorn 1500 3 Stick	5.20
Thorn 1500 5 Stick	5.99
Thorn 3500	7.98
Thorn 8000	6.95
Thorn 8500/8800	7.15
Thorn 9000	8.70
Decca 1730/1830	5.48
Decca 30	6.76
Decca 80	7.12
Decca 100	7.50
Decca/Tatung 120/130	6.50
GEC 2100	7.40
GEC 2200 (20AX)	6.50
GEC 2040/2028	6.60
GEC 2110 (pre or post Jan '77)	7.00
Philips G8 Short Focus Lead	7.12
Philips G8 Long Focus 550	7.12
Philips G9	6.37
Pye/Philips KT3	12.50
Pye 691/3	7.58
Pye 713 4 Lead	8.79
Pye 713 5 Lead	8.79
Pye 731/25	8.75
R.B.M. A823 plug in	8.75
Rank T20/22	7.12
ITT CVC5/9	7.50
ITT CVC20/25.30 (Mullard)	7.12
ITT CVC45	8.65
Universal	6.00
TV 11 Stick	90
TV 13	1.26
TV 14	1.29
TV 18	1.10
TV 20	1.43

FUSES

Quick Blow 1.25"

100ma	73
250ma-500ma-750ma-1A	60
1.5A-2A-2.5A-3A-5A	60

Quick Blow 20mm

100ma, 250ma, 315ma, 500ma, 630ma, 800ma	90
1A, 1 25A, 1.6A, 2A, 2.5A, 3 15A, 5A	60

Mains Fuses

2A, 3A, 5A, 10A, 13A	1.00

Antisurge 1.25"

250ma, 500ma, 630ma, 750ma, 850ma	1.70
1A, 1.25A, 1.5A, 2A	1.70
2 5A, 3A, 5A	2.70

Antisurge 20mm

80ma	4.80
100ma	2.50
160ma, 200ma	2.20
315ma, 500ma, 630ma, 800ma	1.30
1A, 1.25A, 1.6A, 2A	1.30
400ma, 2.5A, 3.15A, 4A, 5A	1.90

SEND FOR A FULL CATALOGUE
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ARROW STYLI
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(illustrated leaflet available)

T.T.L. 74LS SERIES

74LS00	1.12	74LS37	35	74LS92	65	74LS160	90	74LS251	65
74LS02	58	74LS38	35	74LS93	60	74LS161	85	74LS253	95
74LS03	58	74LS40	35	74LS107	80	74LS162	4.04	74LS257	1.20
74LS04	58	74LS42	80	74LS109	58	74LS163	85	74LS258	95
74LS05	58	74LS47	85	74LS112	50	74LS164	85	74LS259	1.70
74LS08	58	74LS48	83	74LS113	44	74LS165	1.50	74LS273	1.90
74LS10	58	74LS49	33	74LS114	70	74LS173	1.32	74LS283	1.30
74LS11	58	74LS51	33	74LS122	96	74LS174	85	74LS293	1.20
74LS13	37	74LS54	43	74LS123	80	74LS175	85	74LS352	1.40
74LS14	46	74LS55	60	74LS125	85	74LS191	1.02	74LS353	1.40
74LS15	33	74LS73	60	74LS126	60	74LS192	1.30	74LS365	65
74LS20	35	74LS74	65	74LS132	63	74LS193	1.30	74LS366	82
74LS21	35	74LS75	65	74LS138	83	74LS194	75	74LS367	1.67
74LS22	35	74LS76	65	74LS139	65	74LS197	95	74LS368	65
74LS26	44	74LS78	65	74LS151	85	74LS240	2.20	74LS373	1.40
74LS27	35	74LS83	89	74LS153	85	74LS241	2.20	74LS374	1.55
74LS30	35	74LS85	98	74LS155	65	74LS242	2.20	74LS393	1.20
74LS32	90	74LS86	39	74LS156	1.02	74LS243	2.20	74LS670	1.78
		74LS90	1.22	74LS158	65	74LS245	2.30		

CMOS 4000B Series

4001	21	4026	1.99	4068	22	4510	76	4539	77
4002	21	4027	39	4069	22	4512	72	4541	96
4008	72	4028	64	4070	22	4513	1.68	4543	1.12
4011	31	4029	90	4071	40	4514	1.88	4551	96
4012	21	4032	1.04	4072	22	4515	1.88	4553	2.40
4013	30	4035	80	4073	22	4516	76	4554	1.20
4014	74	4038	99	4075	22	4518	76	4556	48
4015	76	4040	72	4076	80	4519	64	4560	1.76
4016	42	4042	58	4077	22	4520	75	4561	74
4017	66	4043	71	4078	22	4521	1.68	4566	1.20
4018	72	4044	71	4081	22	4522	88	4580	3.60
4010	70	4046	96	4093	49	4526	88	4582	1.84
4020	76	4047	70	4094	1.56	4527	1.20	4581	80
4021	70	4049	32	4099	1.20	4528	88	4582	1.00
4022	70	4050	32	4160	72	4529	1.04	4583	40
4023	21	4051	72	4161	72	4530	62	4584	88
4024	50	4052	72	4162	72	4531	72	4585	1.84
4025	21	4053	72	4163	72	4532	1.00	4597	2.40
		4060	96	4502	72	4536	2.64	4598	2.00
		4066	43	4505	1.88	4538	1.04	4599	

VALVES CONT'D

30FL2	1.70
DY802	98
DY86/7	66
ECC81	1.08
ECC82	98
ECC83	1.07
ECC84	80
ECC85	98
ECC88	1.35
ECF80	1.30
ECF82	88
ECH81	1.60
ECH84	1.66
ECL80	84
ECL82	1.30
ECL86	1.99
EF80	95
EF86	2.20
EF183	99
EF184	1.09
EL90	1.75
EL34	3.50
EL84	1.05
EY86/7	68
EY500A	2.25
EZ80/81	56
GY501	1.45
GZ34	3.50
KT66	9.75
KT77	8.50
KT88 (alt type)	12.00
PC92	4.50
PC97	1.65
PCC85	85
PCC805	1.40
PCF80	1.00
PCF200	1.35
PCF800	1.38
PCF801	1.13
PCF802	1.12
PCF805	1.80
PCF808	1.63
PCH200	1.45
PCL82	1.20
PCL84	1.20
PCL805	1.09
PCL86	92
PFL200	1.86
PL36	1.87
PL81	94
PL95	2.25
6L6GT	2.30
12HG7	3.20
12BH7A	2.75
PL504	1.65
PL508	2.90
PL509/19	5.30
PY88	81
PY500A	2.30
PY800/1	69
UCH81	2.25
UCL83	1.82
UY85	1.35
PL802T	4.00
40KD6	5.30
21LU8	3.00
17DW4A	4.50
3AT2B	5.00
12BY7A	3.75

THORN NEW LIFE TUBES AVAILABLE AT TRADE COUNTER

EQUIPMENT

Testlead Set (AVO Type)	2.20
Degaussing Coil Stick	19.00
Signal Injector	4.00
Electric Circuit Tester	1.50
Probes (x10) or (x1)	10.90
Philips Switchable Probes	13.25
Automatic Wire Strippers	6.95
I.C. Inserters	1.18
Micro Pliers	4.20
Micro Cutters	5.00
Trim Tools Metal Ended	30
Side Cutters sm.	1.20
Long Nose Pliers	1.20
Sm. Neon Screwdriver	40
Quick Set Adhesive (Superglue)	75
Dynascan Tube Reju./testers	
467 model inc. bases	399.00
470 model inc. bases	299.00
available without bases for 50.00 less	

Tube Bases For Dynascan

No. 1	9.09	No. 14	16.63
No. 3	9.50	No. 15	16.44
No. 5	9.09	No. 18	10.83
No. 6	11.08	No. 19	10.83
No. 7	9.09	No. 21	14.40
No. 8	10.08	No. 23	13.86
No. 9	9.09	No. 24	27.07
No. 13	11.11	No. 25	12.57

Avo Meters Factory Recon.	119.00
Avo Battery	2.09
Solder Sucker Antistat min.	4.50
Solder Sucker Antistat std.	5.40
Solder Sucker Antistat lge.	6.20
Solder 500g	7.00
D.I.Y. Solder Small Pack	45
Solder Sucker Nozzles	81
Solda Mop Stnd	74
For sold. irons see Antex/Weller Under Specific Spares	
Choc Bloc 5A	30
Fuse Wire 5A, 15A, 30A	05
Fluorescent Starter 4-80W)	15
Battery Press Studs min.	11
Battery Press Studs std.	15
Vero Board	2.59
Double Sided Adhesive Tape	5.75
Tinned Copper Wire	
18S WG 45 Amp	1.86
14SWG 100 Amp	1.86
17SWG 60 Amp	1.86
19SWG 45 Amp	1.86
20SWG	2.75
22SWG	1.86
Insulated Copper Wire	9.11
Cable Ties ALT1 per 100 (small)	84
Cable Ties ALT21 per 100 (large)	1.69
Power Adapter (12v)	5.95
Reg. 88 Power Adap.	5.50
Reg. 650 Power Adap.	6.50

TURBO RECHARGEABLE

Screwdriver Kit	22.71
Drill Kit	25.99
Sold. Iron Kit	16.99
Rep. Tips	2.20
Rep. Bulbs	28

LABGEAR

CM7261 Power Unit 12V	11.80
CM7262 Power Unit 12V	12.86
CM7065 VHF/UHF W/B 12V	15.05
CM7066 UHF/WB	14.04
CM7068 UHF High Gain A/B/CD	16.74
CM7253 Behind Set (Mains)	14.34
CM7243 Second Set Amp	13.66
CM7093 Three Set Amp	16.83
CM7063 Dist. Amp VHF/UHF	24.54
CM7108 8+1 Dist Amp.	43.26
CM9700 27mhz CB Suppressor	4.45
CM6011 Outdoor Splitter	7.83
CM9003 Flush Sing Outlet	1.95
CM9010 Flush Twin Outlet	2.14
CM9034 UHF Filters A/B/CD)	8.07
CM9033 6way Pass Splitter	10.21
CM7042 TV Games Combiner	3.09
CM9009 Flush TV/FM Outlet	3.36
CM9006 VHF/UHF Diplexer	3.97
CM7122 Televerta Up. VHV to UHF	38.01
CM7057 Televerta Down UHF to VHF	43.06
CM7094 Dist Amp. UHF/VHF	30.06
CM7274 4 Way Dist Amp	21.45
CM7082 UHF/VHF Dist. Amp	65.69
CM7080/10 UHF NHA	15.71

EXPORT ORDERS WELCOME

AERIAL EQUIPMENT

Chimney Kits	86
6" pressed bkt.	55
6" bkt. with kit	1.75
9" welded bracket	1.35
9" bkt. with kit	2.90
Double bkts.	2.39
Double bkts. witha kit	4.75
13.5" Cradle bkt.	2.25
13.5" Cradle with kit	4.25
Std repair pack	1.10
Double repair pack(2)	2.39

Please note: We cannot supply aerials or masts via mail order. Available by collection only.

Wall Brackets

6" welded	1.30
12" T&K	3.30
9" welded	1.87
Gutter Brackets	1.00

Clamps

1" × 1"	68
2" × 2"	1.25
Universal No. 1	1.02
1" u bolts	19
J bolts	20
1.25" u Bolts	20
2" u bolts	28

UHF TV Aerial

10 element	1.62
18 element	2.63

UHF TV Aerial

3 element	5.68
4 element	6.50

Masts

3ft crank 7/s shape	1.00
6ft 1"	1.60
10ft 1.5"	5.25
12ft 1.5"	6.00
16ft 2"	9.00

High Gain Aerials

Antiference X68	17.10
Antiference XG14	27.10

Set Top Aerials

Mercury Olympic 11	2.30
Antiference Super Set Top	5.56
Antiference Carratemna	6.80
Antiference Caravan Kit	11.00
Loop Aerial	1.00
Corner Plates	7
Lashing Wire	75
Lead Wall Nails (100)	4.95
Rawbolts	60
Caple Clips (100)	75
Coax Plugs	18
Line Connectors	12
Attenuators	1.80
Tape	76
Wood Screws	7
Mast couplers	8.92
27Mhz filter	2.10

Outlet Boxes

Surface Single	80
Surface Twin	1.10
Y Splitter	85
Flush Single	95
Flush Twin	1.20

Antiference

SB11 Splitter	2.37
CS200 Comb/Split	3.94
COB11 Outlet	96
CS1000 Com/Split	4.77
PV1240 power	11.65
UP1300 MHA	9.09
XS2 xtraset	14.46
XS04 4wayDA	22.50
XS4/6	43.13
Diplexers	68
Match Trans	2.83

Back Boxes

Metal Single	45
Metal Double	80
Plastic Single	61
Plastic Double	1.09

Budget Range

Outdoor Splitter	6.50
Mast Head amp.	6.50
Power Unit	6.50

MULTIMETERS

Amprobe Digital Meter AM7	45.00
Amprobe Digital Meter AM9	55.00
Amprobe Volt/Ameter/Ohmeter RF3	68.00
Philips Meter 2000 R. per V	20.71

CALLERS ALWAYS WELCOME

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ADD 87p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degausing coils please allow £1.50 P+P (U.K.). Export orders charged at cost (including Eire). First Class Mail is used whenever possible. Add 15% VAT to total except where it states zero rate. Builder iterms will be sent by carrier £6.00 + VAT up to 20K (except tubes).

BOOKS AND MANUALS ARE ZERO V.A.T.
Goods are despatched on the day we receive your order If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service V.A.T invoice on request Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice. In some cases we may have to supply an equivalent.

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INTEGRATED CIRCUITS

TYPE	PRICE (£)
AN2140	1.95
AN303	3.75
AN305	3.50
AN318	5.25
AN7114E	2.30
AN7115E	2.35
AN7116	2.10
AN7145M	2.95
AN7168	2.95
HA1339A	2.95
HA1366W	1.85
HA1366WR	1.85
HA1374	2.45
HA1377	2.95
HA1392	2.95
HA1397	3.95
LA1201	1.25
LA1230	2.95
LA1365	2.45
LA4440	2.75
LA4445	2.45
LA4460	2.45
LA4461	2.45
MC13002	3.95
SAA1250	3.85
SAA1251	4.95
SAA3027	3.95
SAA5010	4.95
SAA5012	4.95
SAF1032P	3.25
SAF1039P	2.75
SAS560S	2.45
SAS570S	2.45
SAS580S	2.65
SAS590S	2.65
SL470	2.95
SL471DP	2.95
SL480	2.85
SL490	2.50
SL1430	1.95
SL1432	1.75
SN76660N	.65
STK0039	6.45
STK0040	5.95
STK077	6.95
STK078	6.95
STK2129	8.50
STK433	5.95
STK4332	5.95
STK435	5.95
STK437	6.95
STK439	7.50
STK459	8.55
STK461	8.95
STK463	9.95
STK465	9.95
TA7193P	4.45
TA7204P	1.90
TA7205AP	1.45
TA7222P	1.85
TA7227P	2.95
TBA120AS	.95
TBA120T	1.25
TBA120U	.95
TBA520	1.00
TBA530	1.25
TBA560	1.45
TBA720A	2.95
TBA800	.75
TBA810S	1.25
TBA820	1.10
TBA890	3.25
TBA920S	1.95
TBA950/2X	2.25
TBA1440G	2.95
TBA2800	2.50
TCA270S	1.55
TDA760A	1.95
TDA440	2.95
TDA1035T	2.45
TDA1037	1.95
TDA1044	2.95
TDA1170S	1.80
TDA1180P	2.65
TDA1190Z	2.85
TDA1470	3.25
TDA1506	4.35
TDA1510	3.80
TDA1512	3.35
TDA1515	4.50
TDA1670A	4.20
TDA1770A	3.55
TDA1870	6.50
TDA1908A	2.25
TDA1950A	3.95
TDA2002	1.50
TDA2003	1.55
TDA2004	2.90
TDA2005	3.20
TDA2006	1.95
TDA2020	3.20
TDA2030	1.80
TDA2170	2.95
TDA2270	2.95
TDA2521/3	2.95
TDA2523	2.80
TDA2525	3.20
TDA2530	2.00
TDA2532	2.10
TDA2540	1.95
TDA2541	2.70
TDA2545	3.55
TDA2546	4.95
TDA2560	2.40
TDA2571A	4.95
TDA2576A	3.30
TDA2577	3.50
TDA2578A	2.95
TDA2581	2.00
TDA2582	1.95
TDA2591	2.30
TDA2593	2.30
TDA2594	2.95
TDA2600	6.35
TDA2611A	1.50
TDA2653A	3.55
TDA2655A	5.95
TDA3190	3.95
TDA3540	3.70
TDA3541	3.70
TDA3560	4.95
TDA3561A	4.95
TDA3562A	6.50
TDA3650A	4.75
TDA3651	2.70
TDA3651AQ	3.80
TDA3652	3.35
TDA4500	3.95
TDA4600/2	2.85
TDA4600/2D	3.30
TDA4610	3.50
TDA5700	3.95
TDA8170	3.35
TDA8180	4.50
TDA8190	2.80
TDA9503	2.95
TDA9513	3.20
UPC1031H	2.60
UPC1181H	1.70
UPC1182H	1.70
UPC1185H	2.50
UPC1230H	4.35
UPC1363C	3.95
UPC1365C	4.20

TRANSISTORS

TYPE	PRICE
BC107	.14
BC147	.10
BC148	.10
BC327	.11
BC328	.12
BC337	.11
BC338	.12
BC548	.10
BC547	.10
BC557	.10
BC558	.10
BC637	.30
BC638	.25
BC639	.25
BC640	.30
BD124M	.60
BD131	.33
BD132	.33
BD160	.50
BD201	.80
BD203	.90
BD222	.50
BD225	.50
BD237	.40
BD238	.40
BD438	.70
BD439	.70
BD677	.65
BD701	.95
BD707	.95
BF337	.28
BF338	.30
BF458	.35
BF757	.70
BF758	.70
BF871	.80
BF960	1.25
BR103	.75
BR303	1.95
BT116	1.30
BU126	1.50
BU205	1.40
BU208A	1.45
BU208/02	1.00
BU208D	1.95
BU326A	1.45
BU426A	1.45
BU500	1.95
BU508A	1.75
BU508D	1.95
BU526	2.20
BU807	1.30
BUW81A	3.50
BUX84	.90
R2008B	.70
R2540	2.35
TIP31C	.45
TIP32C	.45
TIP33	.90
TIP41C	.45
TIP42C	.45
15/80H	2.45
15/85R	2.45
2SB618	2.20
2SC867A	3.20
2SC1034	2.40
2SC1114	5.95
2SC1124	1.00
2SC1413A	3.95
2SC1942	2.90
2SC3156	2.50
2SD588	2.20
2SD725	7.95
2SD870	6.50
2SD880	1.25
2SD1398	2.35

DIODES

TYPE	PRICE
BY127	.10
BY164	.45
BY179	.65
BY223	1.25
BY227M	.20
BY299/600	.95
BY299/800	.25
BYX10	.20
BYX55/600	.30
SKE5F3/10	1.45
1N4001-7	.07
1N5401-8	.18

VALVES

DY802	1.00
PCF802	.95
PCF802	1.10
PCL82	1.05
PCL85/805	1.00
PCL86	1.05
PCL200	1.60
PL504	1.60
PL508	3.00
PL509/519	5.95
PY500A	2.25
PY500A	2.25
PY801	1.00
PY81/800	1.05
PY88	1.00

E.H.T. TRAYS

DECCA 80	7.20
DECCA 100	7.35
DECCA 120/130	6.95
ITT CVC20/30	6.95
ITT CVC45	7.30
PHILIPS G8	7.90
PHILIPS KT3	7.95
RBM T20/T22A	7.35
THORN 8500/8800	7.20
THORN 9000	8.00
UNIVERSAL	5.95

LINE O/P TR.

DECCA 80	7.95
DECCA 100	8.30
ITT CVC20	8.50
ITT CVC25/30/32	8.40
ITT CVC45	7.95
PHILIPS G8	8.75
PHILIPS G11	14.95
PHILIPS KT3	9.25
PHILIPS K30	12.95
RBM T20/T22A	9.95
THORN 1615	9.75
THORN 1690/1	9.95
THORN 1790/1	7.95

PUSH BUTTONS

DECCA/ITT 4 way	5.00
DECCA/ITT 6 way	8.50
ITT CVC5 7 way	10.40
ITT CVC8/9	12.80
ITT CVC45 (port.)	22.95
PHILIPS G8 (S/L 550)	14.50
PHILIPS KT3	8.95
PYE G11	8.50
RBM T20A 6 way	11.95

TUNERS (NEW)

ELC 1043/05	8.50
ELC 1043/06	9.35
ELC 2003	18.95
U321	8.75
U322	8.80
U341	7.50
U343	16.95
U411	11.95

TV ELECTROLYTICS

DECCA 80 (400/800)	3.95
FIDELITY ZX(220/385)	2.95
PHILIPS G8(600/300)	2.65
PHILIPS G11(470/250)	2.20
RBM T20A(220/400)	2.50
THORN 9000(400/400)	2.90

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Dual PTC	2.85
I.F. Gain Unit	22.95
Line O/P Trans.	23.50
RFI Choke	2.55
Service Manual	28.50
Tuner	14.95

TX10

Focus Unit	8.50
Line O/P Trans.	32.95
On/Off Switch	1.70
Service Manual	42.95
Tuner	14.95
10K ROT. POT.	.60

TX90

Line O/P Trans.	19.30
On/Off Switch	1.20
Tuner	15.95
Service Manual	10.95

TX100

Choke	.85
Line O/P Trans.	16.95
On/Off Switch	1.10
Service Manual	10.95
Teletext Board	64.95
Tuner	15.95

GEC/HITACHI TV SPARES

FRAME MODULES

HM6232	5.95
HM6251	4.70
HM9032	5.70
STR441	5.50
STR451	5.50
STR454	5.50
STR6020 (Kit)	6.35
ET548 Tuner	14.95
ET556A Tuner	9.95

GEC/HITACHI VIDEO SPARES

V4000H/VT8000

Audio Head	18.95
Capstan Motor	31.90
Idler F.F./Rew	1.85
Pilot Lamp	.65
Pinch Roller	4.95
Play Idler	3.95
Service Manual	6.30
Video Head	34.95

V4100H/V4002H 9300E/9500E

Capstan Motor	30.95
Idler F.F./Rew	1.80
Play Idler	4.30
Pinch Roller	5.50
Pulley F.F./Rew	.40
R.F. Converter	28.95
Video Head	34.95
Relay	2.95

V4100H/VT11E

Audio Head	19.95
Capstan Motor	21.95
Clutch Assy	9.40
F.F./Rew Arm	2.90
Pinch Roller	5.50
Relay	2.95
Service Manual	6.50
Video Head	32.95

V4004H/TV33E

Video Head	34.95

NAT. PAN. VIDEO SPARES

NV333 Idler	1.10
NV2000 Idler	1.30
NV3000 Idler	1.25
NV7000 Idler	1.20
NV370 Idler	4.75
NV2000 Load. Gear	1.60
NV333 Pinch Roller	4.95
NV7000 Pinch Roller	4.95

PHILIPS VIDEO SPARES

VCR 6460/00/05

Audio Head	25.95
Idler Arm	8.25
F. Load Motor	14.10
Loading Motor	12.95
Service Manual	7.50
Take-up Reel	5.30
Tuner	13.95
Video Head	59.95

VCR 6462/00

Capstan Motor	38.95
Control Motor	9.95
Erase Head	11.75
Modulator	35.95
Winding Motor	43.35
Video Head	39.95

VCR 6520/00/05

Audio Head	26.50
F/Load Motor	14.10
Idler Unit	8.25
Loading Motor	12.95
Service Manual	7.50
Take-up Reel	5.60
Video Head	59.95

VCR 6560/00/05

Capstan Motor	44.70
Control Motor	8.50
Modulator	48.60
Video Head	32.95

VCR 6660

Capstan Motor	36.95
Control Motor	9.95
Take-up Idler	8.95
Video Head	39.95

SONY SPARES

C5/C7

Ace Head Assy	35.50
Limiter Assy	3.15
Motor (BHF1100D)	39.95
Pinch Roller	1.30
Rewind Kit	5.25
Service Manual C5	9.40
Service Manual C7	9.40
Video Head	45.00

C6

Ace Head Assy	42.20
Reel Motor	17.60
Reel Motor (C6MKII)	28.00
Rewind Kit	4.20
Service Manual (C6)	9.40
Service Manual (C6MKII)	9.40
Video Head	45.00

C9

OC-DC Conv.	22.70
Gear Kit	6.70
Guide Pin Kit	4.95
Service Manual	9.40
Video Head	45.95

VIDEO BELT KITS

Hitachi 9300/9500	1.80
Hitachi VT11E	2.95
Nat. Pan. NV333	2.20
Nat. Pan. 2000	2.55
Nat. Pan. NV3000	1.90
Nat. Pan. NV7000	2.25
Nat. Pan. NV8600	2.90
Sanyo 5000	1.00
Sanyo 5300	2.45
Sharp 7300	2.60
Sharp 8300	2.45
Sharp 9300	2.45
Sony C5/C7	2.80
Sony C6	2.45
Thorn 3V00/16/22	2.80
Thorn 3V29	1.80

V.C.R. PILOT BULBS

Hitachi 9300	.95
National NV2000	1.00
Sharp 8300	1.00
Sharp 9300	2.65
Thorn (Plug)	.95
Universal	.50

THORN SPARES

3V00/16/22

Capstan Motor	49.95
Drum Motor	63.95
F/F Idler	1.60
Pinch Roller	7.20
Rewind Idler	6.25
Take-up Idler (LG)	7.50
Take-up Idler (SM)	5.80
Video Head (3HSS)	32.95

3V29/30

Capstan Motor	38.60
Loading Motor	8.95
Pinch Roller	6.95
Reel Motor	31.90
Take-up Clutch	2.35
Take-up Idler	1.40
Video Head (3HSS)	32.95

3V35/36

Capstan Motor	28.50
Cass. Housing	34.95
Cass. Motor	6.70
Erase Head	9.60
Guide Roller	.30
Leaf Switch	1.45
Service Manual	26.00
Take-up Clutch	2.45
UHF Tuner	36.50

VIDEO MOTORS

Capstan Motor to fit Thorn 3V00/16/22 ..... 24.95
Drum Motor to fit Thorn 3000/16/22 ..... 24.95

SANYO SPARES

5000/5300

Capstan Motor	32.95
Gear Idler	6.95
Load. Roller	1.95
Pinch Roller	6.85
Reel Motor	9.95
Reel Pulley	6.95

SHARP SPARES

9300/9700

Reel Motor	15.95
Reel Idler	3.30

ON/OFF SWITCHES

Fidelity	1.70
Fidelity (Rem)	2.95
Philips G11	1.35
Philips G11 (Rem)	1.85
Philips KT3 (Rem)	2.45
Pye G11 (Rem)	1.90
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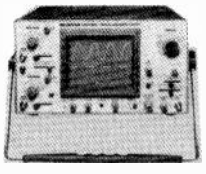

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3808 FIDELITY ZX2000/3000 14.50
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3645 THORN 1500 24" 5.95
3646 THORN 1590 SERIES 10.85
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3651 THORN 3K 3K5 8.96
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5404 BG2097-642/333 7.50
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3662 DECCA 80 7.25
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3675 ITT CVC5/9 4.80
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3684 PHILIPS G9 4.00
3685 PHILIPS KT3 6.95
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3688 PYE 725/731/741 8.91
5395 SEIMANS TVK186/5 9.50
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3549 DECCA 100 400+800 350/250V 4.85
3548 DECCA 80/100CHAS 100/400V 2.90
5304 FIDELITY ZX2000 330 385V 4.95
5303 FIDELITY ZX3000 220 385V 3.98
3557 ITT CVC20/RRI T20 220/400 2.37
3556 ITT CVC5/9 200X2+25+75ETC 3.26
3560 PHILIPS G11 470UF/250V 1.79
3559 PHILIPS G9 2200/63V 1.55
3561 PHILIPS KT3 200+25X2/385V 2.65
3554 PHILIPS G8/GEC 2110 600/300V 3.23
3558 PHILIPS G9/PYE 731 600/300 PC 3.16
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3576 RRI AB23 2500X2/25V 1.48
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3585 TCE1500 150X2+100/300V 2.35
3587 TCE3000 200+100X2/350V 2.86

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4270 0.01 600V X5 0.75
4272 0.022 1KV X5 1.35
4273 0.033 1KV 1.40
4274 0.047 600V X5 0.85
4275 0.047 1KV X5 2.47
4276 0.1 600V X5 1.20
4277 0.1 1KV X5 1.98
4278 0.1 1250V X5 2.39
4279 0.1 2KV X1 0.75
4280 0.22 600V X5 1.45
4281 0.22 1KV X1 0.74
4282 0.47 1KV X1 1.02
4283 4700PF 1.5KV X5 1.89
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4883 100K LIN STD TV 0.55
4884 150K LIN STD TV 0.55
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4880 22K LIN STD TV 0.55
4881 22K LOG STD TV 0.55
4875 3K3 SEMI LOG STO 0.60
4885 470K LOG STD TV 0.55
4720 470R LG STD 0.99
4719 470R LM STO TV 0.99
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STANDARD RANGES
VERTICAL STANOARD X 5 0.60
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4664 ELC 1043/05 EXCH TUNER 6.00
4663 ELC 1043/06 NEW TUNER 8.25
4666 ELC 1043/06 EXCH TUNER 6.00
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4679 RRI RANGER1/2 EXCH TUNER 9.75
4680 RRI T20 NEW TUNER 12.40
4678 RRI RANGER2/3 NEW TUNER 13.15
4668 U321 EXCH TUNER 6.50
4667 U321 TUNER NEW 6.25
4670 U322 EXCHANGE TUNER 6.50
4669 U322 NEW TUNER 7.95
4673 U341 EXCHANGE TUNER 7.25

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3883 DY802 VALVE 0.75
3932 PCF802 VALVE 1.45
3938 PCL805 1.00
3935 PCL82 VALVE 0.95
3936 PCL84 VALVE 0.85
3937 PCL86 VALVE 0.95
3940 PFL200 VALVE 1.20
3943 PL504 VALVE 1.50
3944 PL508 VALVE 2.06
3945 PL509 VALVE 6.25
3948 PL519 5.95
4870 PL802 VALVE 4.95
3950 PY500A VALVE 2.45
3951 PY801 VALVE 0.95

THORN SPARES

2897 T1590 MAINS TRANSFORMER 9.80
2920 TX10 FOCUS UNIT 7.54
4590 T1600 MAINS TX 7.82
5430 T1690 MAINS TRANSFORMER 9.80
4973 T1690 SLOW MOT. TUN. POT 3.99
2906 T3000/3500 A1 SWITCH 1.68
2904 T3000/3500 MAINS TX 5.00
2908 T3000/3500 METAL CUT OUT 2.34
4587 T3500 100R CONVERG POT 0.85
3277 T3500 200R CONVERG POT 0.56
3278 T3500 500R CONVERG POT 0.56
4585 T3500 50R CONVERG POT 0.65
2905 T3500 5MEG A1 POT 1.17
4589 T3500 SPARK GAP .1/1500 0.51
2907 T3500 THICK FILM VIO LOAD 1.55
4563 T38000 MAINS ON/OFF SW. 3.10
4412 T4000 FOCUS CONTROL UNIT 7.68
3273 T6818 220K BRIGHT CTRL 2.18
2909 T8500 FOCUS CONTROL UNIT 2.56
2911 T8500 MAINS CHOKE 17.45
4415 T8500 MAINS TX 12.75
2910 T8500 PLASTIC CUT OUT 3.72
2918 T9000 FOCUS UNIT 4.85
4556 T9000 FRI THICK FILM 1.65
2919 T9000 OVER VOLT THICK FILM 3.95
4555 T9000 T701 CHOPPER TX. 13.75
4982 T9600 0.33 2KV CAP 2.35
2914 T9600 CHOPPER TX T512 8.11
2916 T9600 FOCUS UNIT 2.95
2913 T9600 SWITCH MODE TX T511 9.98
2917 T9800 FOCUS UNIT 5.93
4429 T9800 MAINS CHOKE 11.03
4437 TX10 .0022 2KV 0.25
4658 TX10 100K TUNING POT 0.64
2938 TX10 CHOPPER DRIVER TX 3.27
5427 TX10 SW NONREM CONT. 2.32
2922 TX10 TUNER DRAWER ASSY 1.95
4859 TX9 4" RND 15R SPEAKER 6.95
2937 TX9 INPUT CHOKE L65 12.05
2936 TX9 L64 BILIFAR CHOKE 4.25

DECCA SPARES

4616 DECCA 100 0.01 2KV CAP 0.98
2933 DECCA 100 BEDIGE TX 2.35
2932 DECCA 100 FOCUS CONTROL 2.77
4615 OECCA 100 LINE DRIVE TX 2.25
2928 DECCA 10SER 470K SH+VOL 2.15
4603 DECCA 2230 10R FUSIBLE 0.70
2930 DECCA 2233 PSH PSH SH 5.14
2931 DECCA 2263 PSH PSH SH 4.20
2926 DECCA 30 SER 3R9 RESIS. 0.50
2924 DECCA 30 SER MAINS TX 12.35
2929 DECCA 30 SER 47K SH+VOL 2.45
2939 DECCA 80 470R SH+VOL 2.45

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½ WATT X 10 0.29
1 WATT X 10 0.45
2 WATT X 10 0.60

SAFETY CERAMIC
STANDARO RANGES
5 WATT X 5 0.90
7 WATT X 5 0.74
11 WATT X 5 0.89
17 WATT X 5 1.15

OTHER RESISTORS

3279 2M2 H/V FOCUS RESISTOR 0.46
3280 22M H/V FOCUS RESISTOR 1.59
3281 33M4 H/V FOCUS RESISTOR 1.59
3282 47M H/V FOCUS RESISTOR 1.50
3283 56M H/V FOCUS RESISTOR 1.50

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3025 MAINS DROPPER RANK A640 1.20
3013 MAINS DROPPER DECCA 80/100 1.60
3016 MAINS DROPPER GEC 2010 0.90
3031 MAINS DROPPER THORN 3500 0.98
3030 MAINS DROPPER THORN 1600 1.78
4910 MAINS DROPPER DECCA 100 2R5 0.82
3034 MAINS DROPPER THORN 9800 1.60
3027 MAINS DROPPER THORN 1400 1.50
3026 MAINS DROPPER RANK A823 1.10
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3022 MAINS DROPPER PYE 725/731 1.40
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3019 MAINS DROPPER PHILIPS G8 47R 0.65
3033 MAINS DROPPER THORN 8500/8800 0.98
5385 MAINS DROPPER DECCA 80 2.97
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5533 PYE CT200 PHILIPS 579 OROPPER 3.45

UNIVERSAL CONVERGENCE POTS

5R, 10R, 22R, 20R, 25R, 50R, 75R, 100R, 200R, 250R, 500R 0.48

FIDELITY SPARES

2940 CHOPPER TX FIOELITY CTV14R 4.50
2942 DRIVER TX FIDELITY CTV14R 8.65
2941 FOCUS UNIT FIDELITY CTV14R 0.50
5408 MAINS INPUT CHOKE ZX2000 3.45
5504 MAINS FILTER TX CTV14R 2.95
5505 DRIVER TX ZX3000 404387 8.95
6162 ON/OFF SH FIOELITY CTV14R 2.25
6163 ON/OFF SH FIOELITY CTV14S 1.65

GEC SPARES

2965 GEC 1401 CHOPPER TX 16.56
2964 GEC 1401 INPUT CHOKE 9.63
5531 GEC 1501 MAINS TX 5.25
4758 GEC 2100 3R FUSIBLE RES 1.45
4759 GEC 2110 SH2 2KV CAPS 2.39
2959 GEC 2100 ETC FOCUS VDR 1.60
2958 GEC 2100 THERMAL CUT OUT 0.97
4760 GEC 2110 FOCUS CONTROL 5.98
4771 GEC 2110 LUM. DELAY LINE 1.83
4728 GEC 2110 MAINS CHOKE 10.50
4996 GEC 2110 NEONS 0.20
4751 GEC 2114 VOL+SWITCH CONT 1.98
4656 GEC 22K MULTI TURN POT 0.98

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2949 GRUNDIG 5010 FOCUS VDR 3.35
4633 GRUNDIG 5010 CONTROL TX 4.76
2948 GRUNDIG 5010 FOCUS UNIT 3.75
4865 GRUNDIG 5010 L515 CHOKE 1.63
4744 GRUNDIG 5010/6010 LID 2.62
4745 GRUNDIG 5011 LID 2.59
4637 GRUNDIG 5011 SH+SLIDERS 11.69
2952 GRUNDIG 6010 MIXIE MOO 22.50
4630 GRUNDIG 6011 MAINS SH 3.69
4631 GRUNDIG 6110 MAINS SH 4.86
2947 GRUNDIG A6400 MAINS SH 4.95

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4314 DECCA 100 (TEST+PREST) RCU 22.28
4310 DECCA 80/100 SERIES RCU 21.76
4315 DECCA 90/100 N/TXT RCU 20.78
4324 GEC 2 FUNCTION RCU 20.25
4325 GEC C2057H/2067H RCU 21.43
4326 GEC TELEMASTER 12 RCU 20.03
4327 GEC TELEMASTER 16 RCU 20.03
4328 GEC TELEMASTER 8 RCU 23.98
4332 GRUNDIG TELEPILOT 12 RCU 30.03
4333 GRUNDIG TELEPILOT 16 RCU 25.05
2955 GRUNOIG TELEPILOT 7 24.95
4334 GRUNOIG TELEPILOT 8 RCU 20.03
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4358 KORTING 16 CHANNEL RCU 24.05
4380 PHILIPS G11 NONTEXT RCU 23.55
4378 PHILIPS G11 T/TEXT 8CH RCU 20.78
5409 PHILIPS G11 T/TEXT U/SONIC 25.16
5453 PHILIPS KT3 REMOTE RC4001 16.00
4379 PHILIPS/PYE G11 2 FUNC RCU 18.90
4359 PHILIPS/PYE KT3/KT30 16.13
4385 RBM 16CH NONTEXT RCU 24.10
4386 RBM 8CH NONTEXT RCU 23.40
4387 RBM TEXT&V/DATA RCU 20.78
2980 REMOTE CTRL UNIT PHILIPS G9 9.85
4390 TCE 9000CHAS 2 FUNC RCU 19.20
4398 TCE TX10(9653)+TEXT RCU 24.78
4400 TCE TX10(9670)+PREST RCU 21.78
4397 TCE TX9/TX10 19.20

PUSH BUTTON UNITS

2870 4 WAY DECCA ETC 0.25
2871 6 WAY DECCA 12.37
2873 4 WAY HITACHI ETC 5.50
2875 4 WAY PYE/TCE 10.87
2877 6 WAY GEC 2110 11.85
2878 7 WAY GEC 2112 10.95
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2880 6 WAY PYE 713 15.75
2881 6 WAY T9000 7.25
2882 4 WAY BUSH A823 10.93
2884 6 WAY MOD CVC9 12.85
2885 6 WAY 520 PHILIPS 19.30
2886 6 WAY PHILIPS 550 13.20
2887 T1P SWITCH UNIT PHILIPS G11 27.50
2888 6 WAY PYE G11 11.25
2889 PIANO KEY MOD DECCA 2631 22.48
4935 7 WAY ITT CVC5 12.90
5278 GEC 2136 TAPEREO 12.62
5279 ITT 6 WAY +VCR 10.70
5280 6 WAY BUSH T20 14.55

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2972 ITT CP340 PB ASSY 22.98
4501 ITT CP340 SLIDER ASSY 7.58
4683 ITT CV40 FOCUS UNIT 1.95
5543 ITT CVC20 LINE DRIVE TX 3.05
4571 ITT CVC20 MAINS SWITCH 1.36
4787 ITT CVC25 6N2 2KV CAP 1.35
4786 ITT CVC25 8N2 2KV CAPS 2.15
2970 ITT CVC25 BRIDGE COIL 4.30
4789 ITT CVC25 E/W LOAO COIL 1.92
4567 ITT CVC25/30 MAINS SW. 6.89
2969 ITT CVC32 DRIVER TX 2.55
4568 ITT CVC32 REMOTE MAIN SH 7.67
2971 ITT CVC32 SH MODE TX 5.00
4795 ITT CVC45 ON/OFF SWITCH 2.09
3286 ITT CVC5 1MFD 250V CAP 0.40
4569 ITT CVC5 MAINS SWITCH 1.58
4781 ITT CVC5 SHIFT POT 25R 1.82
4780 ITT CVC5 SLIDER BANK 7.41
2967 ITT CVC5-9 MAINS TX 8.48
4570 ITT CVC9 MAINS SWITCH 5.61

FUSES

STANDARO RANGES
20MM O/B FUSE X 10 0.66
20MM A/S FUSE X 10
63MA - 160MA 1.80
200MA - 5A 1.20
1.25" O/B FUSE X10
250MA - 800MA 0.95
1A - 5A 0.70
1.25" A/S FUSE X 10
250MA - 2A 1.50
2.5A - 5A 2.30
PLUG TO P FUSE X 10 0.95
2, 3, 5, 7, 10, 13A

SERVICE MANUALS

5011 DECCA 101/100 6.00
5047 DECCA 80 CHASIS 6.00
5442 DECCA/TATUNG 120 7.00
5022 GEC C2055H-C2255H 6.00
5023 GEC C2065H-C2265H 4.95
5026 GEC C2110-C2149 6.00
5068 HITACHI CPT2024 5.00
5074 HITACHI CPT2234 5.00
5094 ITT CVC20 4.00
5095 ITT CVC25+30 9.00
5096 ITT CVC40 9.00
5097 ITT CVC45/1 5.00
5513 ITT CVC800/801 5.00
5093 ITT CVC9 4.00
5123 MITSUBISHI CT200B 5.00
5527 PANASONIC TC2205 9.00
5116 PANASONIC TX2234 5.00
5127 PHILIPS G11 CHASSIS 4.00
4515 PHILIPS KT3 SERV. 3.94
5135 PHILIPS T8-E 2.00
5136 PHILIPS TX 2.00
5143 PYE 725 731 SER 5.00
5145 REDIFFUSION MK1 3.00
5146 REDIFFUSION MK3 3.00
5147 REDIFFUSION MK4 5.00
5148 REDIFFUSION MK5 4.00
5167 THORN 1500 1.00
5168 THORN 1600 1.50
5171 THORN 1615 3.00
5172 THORN 1690-1691 5.00
5184 THORN 38030 2.00
5187 THORN 3V01 12.00
5188 THORN 3V16 21.87
5178 THORN 9000 6.00
5182 THORN 9800 10.00

RANK RADIO SPARES

4650 RRI T20 SPEAKER 2.36
5524 RRI T24E ON/OFF + VOL SH 2.35
4842 RRI 1122 SH+VOL 22K PULL 3.10
4843 RRI A823 100K TUNER POT 1.78
4847 RRI A823 FOCUS ASSEMBLY 6.03
2998 RRI A823 PLASTIC CAM 0.35
5300 RRI A823ETC RING SPK GAP 0.55
4988 RRI T20 (TYPE) FOCUS ASY 0.60
3001 RRI T20 3K3 SH+VOL CTRL 2.67
4852 RRI T20 9N1 2KV CAP. 1.98
4853 RRI T20 CONTRAST+AFC POT 3.23
3003 RRI T20 E/W CORR. COIL 3.29
3000 RRI T20 FOCUS ASSY 3.50
3004 RRI T20 SH MODE TX 11.20
4849 RRI 2718 3K3 SH+VOLUME 3.36

PHILIPS PYE SPARES

4969 PHILIPS 128711 4K7 VOL+SH 4.45
3288 PHILIPS 300 470L VOL+SWITCH 3.25
4449 PHILIPS 570/713 IF MOOULE 7.00
5425 PHILIPS CTX-S EHT LEAD 7.65
5418 PHILIPS CTX-S FOCUS UNIT 5.50
4655 PHILIPS G11 100K TUNER POT 0.66
2983 PHILIPS G11 CVC32 B/COIL 1.95
2984 PHILIPS G11 E/W CORR COIL 2.64
2985 PHILIPS G11 FILTER COIL 12.80
2986 PHILIPS G11 FOCUS UNIT 9.15
2987 PHILIPS G11 G2 CONTROL ASSY 7.98
4575 PHILIPS G11 RND SHAFT SH. 2.32
4576 PHILIPS G11 SQ SHAFT SWITCH 2.32
4645 PHILIPS G11 TDA2600 HOLDER 0.65
5284 PHILIPS G8 100K TUN P/SET 0.84
2977 PHILIPS G8 10K COLOUR CTRL 0.98
4525 PHILIPS G8 10K CON POT (550) 0.87
4524 PHILIPS G8 15R CON POT (550) 1.07
2975 PHILIPS G8 2K2 BRIGHT CONTL 2.11
4526 PHILIPS G8 2H A1 POT (550) 3.80
4522 PHILIPS G8 5N1 1500V CAP. 1.88
4523 PHILIPS G8 5R CONV POT (550) 0.64
4858 PHILIPS G8 6×4" 70R SPKR 5.98
2979 PHILIPS G8 EQUALIS. COIL 3.20
4503 PHILIPS G8 METAL SH 1.72
2978 PHILIPS G8 RED/GRW SYM COIL 5.01
4504 PHILIPS G8/G11 NON REM SH 1.72
5307 PHILIPS K12 THICK FILM UNIT 16.35
4649 PHILIPS KT3 4X4 SPEAKER 2.85
4566 PHILIPS KT3 MAINS SWITCH 7.32
4907 PHILIPS KT4 THICK FILM UNIT 10.29
4564 PHILIPS T173 MAINS SWITCH 3.45
4648 PHILIPS G11 6X4 SPEAKER 3.85
2992 PYE 169 LINE OSC COIL 3.45
4839 PYE 731 3R3 50W RESISTOR 1.98
4535 PYE 731 47K VOL SWITCH 5.25
2992 PYE 731 FOCUS UNIT 3.45
5545 PYE 731 L/H 3X 100K PSET 3.20
5546 PYE 731 R/H 3X 100K PSET 3.20
2994 PYE 731 THICK FILM ASSY 2.85
4838 PYE KT2 FOCUS UNIT 2.85
4864 PYE T194/6 SPEAKER 6.65
5556 PHILIPS G11 SHORT SHAFT SH 2.01

THORN VIDEO SPARES (OVER 450 PARTS)

QUOTE THORN PART NUMBER IF POSSIBLE
5561 T3292 BOOSTER 44.62
5562 T3292 CAPSTAN BELT 3.48
5563 T3292 CAPSTAN MOTOR 51.16
5568 T3292 CASSETTE LAMP 1.80
5569 T3292 COUNTER BELT1 0.60
5571 T3292 COUNTER BELT2 0.60
5575 T3292 DRUM MOTOR 47.70
5577 T3292 F/F IDLER 2.02
5582 T3292 GUIDE ROLL. ASSY 11.40
5585 T3292 LOWER ORUM ASY 80.48
5587 T3292 PINCH ROLL ASSY 11.45
5591 T3292 REWIND IOLER ASSY 7.04
5592 T3292 REWIND RUBBER TYRE 0.60
5621 T3292 UNLOADING BELT 0.78
5622 T3292 UNLOADING IDL. ASSY 6.43
5624 T3292 UPP/DRUM KIT+MOD 35.94
5629 T3V00 CAPS. MOTOR BELT 0.60
5635 T3V00 COUNTER BELT 1 0.60
5637 T3V00 DRUM MOTOR 49.39
5646 T3V00 PINCH ROLLER ASSY. 7.31
5648 T3V00 RECORDING LAMP 2.34
5650 T3V00 SERVICE MANUAL 17.57
5655 T3V00 T/U IDLER ASSY 6.35
5657 T3V00 UPPER DRUM+MOD KIT 35.94
5663 T3V16 PINCH ROLLER ASSY 7.31
5666 T3V00 CAPSTAN MOTOR 51.16
5646 T3V00 PINCH ROLLER ASSY. 7.31
5648 T3V00 RECORDING LAMP 2.34
5650 T3V00 SERVICE MANUAL 17.57
5655 T3V00 T/U IDLER ASSY 6.35
5657 T3V00 UPPER DRUM+MOD KIT 35.94
5663 T3V16 PINCH ROLLER ASSY 7.31
5666 T3V00 CAPSTAN MOTOR 51.16
5688 T3V00 TENSION BAND 2.16
5689 T3V00 TIMING GEAR 4.12
5692 T3V00 UNLOADING IOLER ASSY 6.43
5710 T3V01 TENSION BAND 2.16
5716 T3V16 CAPSTAN BENT 3.85
5720 T3V16 CASSETTE LAMP 1.80
5721 T3V16 CHANGE GEAR 0.85
5726 T3V16 DIODE STACK 3.41
5727 T3V16 DRIVE ARM ASSY 4.50
5750 T3V16 SERVICE MANUAL 21.87
5758 T3V16 T/U IDLER ASSY 6.25
5759 T3V16 T/U IDLER ASSY (LA) 8.95
5765 T3V16 UNLOADING IDLER 6.43
5772 T3V22 CAPSTAN MOTOR 51.16
5773 T3V22 CAPSTAN MOTOR BAND 0.60
5774 T3V22 CAPSTAN BELT 3.86
5790 T3V22 F/F IDLER 1.74
5803 T3V22 GUIDE ROLLER ASSY 8.39
5807 T3V22 MICRO SWITCH 4.25
5809 T3V22 PINCH ROLLER ASSY 7.31
5814 T3V22 REWIND IDLER ASSY 7.04
5822 T3V22 SUPP SPOOL CARRIER 4.00
5824 T3V22 TAKE UP IDLER SMALL 6.25
5825 T3V22 TAKE UP IDLER LARGE 8.95
5828 T3V22 TENSION BAND 2.16
5834 T3V22 UPPER DRUM ASSY 35.94
5840 T3V23 BOOSTER 24.71
5844 T3V23 CAPSTAN MOTOR 55.83
5852 T3V23 CONNECT GEAR ASSY 6.56
5856 T3V23 GUIDE ROLLER TYRE 0.50
5862 T3V23 PINCH ROLLER ARM AS 4.10
5868 T3V23 REEL IDLER ASSY 2.88
5869 T3V23 REEL MOTOR ASSY 32.81
5879 T3V23 T/U REEL DISK ASSY 5.17
5880 T3V23 TAKE UP REEL ASSY 2.58
5882 T3V23 UPPER ORUM ASSY 35.94
5885 T3V23 WORM GEAR SPINOLE 5.95
5886 T3V23 WORM GEAR SPROCKET 1.63
5888 T3V24 BRAKE SHOE 0.60
5896 T3V24 CASSETTE LAMP 1.80
5899 T3V24 DEW SENSOR ASSY 9.85
5902 T3V24 F/ERASE HEAD ASSY 10.41
5908 T3V24 LOADING GEAR ASSY 28.91
5909 T3V24 LOADING MOTOR 10.25
5912 T3V24 PINCH RLR LVR ASSY 0.62
5920 T3V24 SERVICE MANUAL 28.50
5945 T3V29/30 BOOSTER 24.71
5946 T3V29/30 BRAKE SHOE 0.67
5951 T3V29/30 CAPSTAN BELT 1.95
5952 T3V29/30 CAPSTAN MOTOR ASSY 36.88
5957 T3V29/30 CASSETTE LAMP 1.85
5962 T3V29/30 EJECT LCK ARM 0.80
5974 T3V29/30 LOADING MOTOR 10.25
5976 T3V29/30 LOHR DRUM ASSY 78.72
5980 T3V29/30 PINCH RLLR ASSY 10.06
5981 T3V29/30 PINCH RLLR SLND 10.15
5985 T3V29/30 REEL MTR ASSY 34.66
5990 T3V29 SERVICE MANUAL 25.85
5991 T3V30 SERVICE MANUAL 15.75
5998 T3V29/30 TAKE UP CLUTCH 0.60
5999 T3V29/30 T/U CLUTCH ASSY 2.78
6001 T3V29/30 T/U LDG RING ASSY 2.73
6003 T3V29/30 T/U SPL IDLER 2.64
6012 T3V31 BOOSTER 32.37
6016 T3V31 CAPSTAN BELT 1.95
6017 T3V31 CASSETTE LAMP 1.71
6027 T3V31 LOADING GEAR ASSY 6.60
6028 T3V31 LONG TRIMMING TOOL 0.93
6030 T3V31 PINCH ROLLER ASSY 8.66
6033 T3V31 SERVICE MANUAL 27.31
6034 T3V31 SERVO TEST JIG 49.94
6038 T3V31 TAKE UP CLUTCH ASSY 2.75
6039 T3V31 T/U LOAD/RING ASSY 2.73
6042 T3V31 UPPER ORUM ASSY 35.94
6044 T3V32 BOOSTER 32.37
6048 T3V32 CAPSTAN BELT 1.95
6053 T3V32 CASS MOTOR ASSY 10.39
6066 T3V32 LOADING GEAR ASSY 6.60
6068 T3V32 PINCH ROLLER ASSY 8.66
6071 T3V32 SERVICE MANUAL 18.65
6072 T3V32 SUPP/LDG RING ASSY 2.58
6081 T3V32 UPPER ORUM ASSY 35.94
6083 T3V35/6 BRAKE PAO X2 0.67
6086 T3V35/6 BRAKE SHOE 0.67
6087 T3V35/6 BRUSH ASSY 2.87
6090 T3V35/6 CAPSTAN MOTOR 23.91
6091 T3V35/6 CASSETTE MOTOR 8.10
6103 T3V35/6 PINCH ROLLER 9.84
6105 T3V35 REMOTE CONTROL 19.43
6107 T3V35/6 SERVICE MANUAL 25.00
6117 T3V35/6 TENSION BRAKE 0.60
6118 T3V35/6 UPPER DRUM ASSY 35.94
6119 T3V40 SERVICE MANUAL 15.00
6158 T3V29/30 UPPER DRM ASSY 35.94

SONY VIDEO

6133 SONY 8000UB FORWARD BELT 1.20
6136 SONY C6UB THREADING BELT 1.20
6138 SONY C6UB CAPSTAN BELT 2.19
6145 SONY C7UB BRAKE ASSEMBLY 1.77
6150 SONY C5UB CAPSTAN MOTOR 45.00
6152 SONY C6UB MK2 REEL MTR 23.00
6154 SONY C7 DC MTR (BHF/10D) 38.75
6155 SONY C7UB REMOTE CONTROL 43.75
6156 SONY C5UB REMOTE CONTROL 20.63
6157 SONY C6UB REMOTE CONTROL 18.13
4953 SONY C5/7 REWIND KIT 6.18
4954 SONY C6 REWIND KIT 5.40
4948 SONY SL-7/SL-77 BELT KIT 4.00
4944 SONY SLC7/SLJ7 BELT KIT 5.50
4949 SONY SLT 9ME/J9 BELT KIT 4.50

GEC

6173 V4000H UPPER CYLINDER 40.50
6174 V4000H RELAY 4.12
6175 V4000H PINCH ROLLER 7.44
6178 V4000H CAPSTAN MOTOR 38.78
6181 V4000H TAPE SENSOR LAMP 0.79
6185 V4001H PINCH ROLLER 5.81
6192 V4002H UPPER CYLINDER 40.50
6204 V4004 CLUTCH ASSY 11.16
6212 V4100 AUDIO CONTROL 28.13
6253 V4000H SERVICE MANUAL 10.50
6254 V4001H SERVICE MANUAL 8.31
6255 V4002H SERVICE MANUAL 11.08
6256 V4004 SERVICE MANUAL 11.50
6257 V4100 SERVICE MANUAL 8.31

HITACHI VIDEO SPARES

6214 8000 UPPER CYLINDER 38.99
6218 8000 AUDIO CONTROL 23.85
6220 8000 F/FWD REWIND ASSY 0.69
6224 9300E RELAY 3.30
6230 9300E TAPE SENSOR LAMP 0.95
6231 9300E TUNER 18.21
6240 VT33E UPPER CYLINDER 38.99
6244 VT33E CAPSTAN MOTOR 27.72
6249 VT11E F/FWD REWIND ARM 4.85
6252 VT11E CAPSTAN MOTOR 23.63

VIDEO HEADS

SEE FULL LIST FOR COMPARISON CHART
6258 BETA – A VIDEO HEAD 40.50
6259 BETA – B VIDEO HEAD 40.50
6265 VHS – A VIDEO HEAD 34.50
6266 VHS – B VIDEO HEAD 34.50
6274 PHILIPS H1500 VIDEO HEAD 50.95
6275 PHILIPS H1700/2 VIDEO HEAD 66.20
6276 PHILIPS 2020/2 VIDEO HEAD 57.95
6277 PHILIPS 2030 VIDEO HEAD 53.98

GENERAL SPARES

4999 ANTEX BIT 1/8" DIAMETER 1.45
5000 ANTEX BIT 3/16" DIAMETER 1.45
4452 ATTENUATOR 12DB 1.68
4469 ATTENUATOR 18DB 1.37
4451 ATTENUATOR 6DB 1.68
5419 COLOUR CRYSTAL 8.86MHz 0.60
4659 HEAT SINK COMPOUND 1.08
5001 QUICK TEST MAINS CONN. 9.30
4700 SERVISOL FOAM CLEANER 1.85
4453 SERVISOL FREEZE-IT 1.15
4724 SERVISOL SW CLEANER 1.85
4516 SERVISOL VIDEO HEAD CLEANER 8.95
4976 SOLDER 0.5 KILO REEL 8.60
4466 SUPER WICK 2MMX1.6M 1.12
4970 TV LOOP AERIAL 0.55
4998 WELLER INST. HEAT GUN TIP 0.68

PLEASE ADD £1.25 POST & HANDLING THEN 15% VAT TO TOTAL.

QUICK SAVE TV SPARES

THE COACH HOUSE, MUXTON LANE, TELFORD, SALOP

FULL LIST OF OVER 3000 ITEMS SENT WITH ORDER OR SEND 9" × 4" SAE. PLEASE USE STOCK NUMBER WHEN ORDERING, OR USE SET MAKER'S PART NUMBER. ACCESS AND VISA ACCEPTED. OFFICIAL ORDERS FROM GOVERNMENT OR SCHOOLS WELCOMED. ALL GOODS ARE STOCK ITEMS.

CENTRAL

T.V. & VIDEO WHOLESALERS LTD.

BIGGEST SELECTION – KEENEST PRICES

FERGUSON MECHANICAL WORKING FROM **£65**

V H S

ELECTRONIC WORKING from £110
ELECTRONIC VIDEOS,
INFRA RED REMOTE CONTROL £125

PLEASE BRING YOUR OWN TEST TAPE

MANY MORE LATE VIDEOS IN STOCK
FERGUSON – 3V35/3V45/3V30/3V29/3V23/3V24/3V22/3V16 ETC
PLUS PANASONIC – HITACHI – J.V.C. – AKAI
SHARPS – PHILIPS – GRUNDIG – TRIUMPH – MITSUBISHI
LARGE SELECTION OF BETAMAX VIDEOS

SPECIAL PRICE

WE HAVE PROBABLY THE BIGGEST STOCK OF THORN TV's IN THE SOUTH OF ENGLAND

WORKING 26" TELETEXT from **£60** inc HANDSET

PLUS WORKING FULL REMOTE from **£40**

WORKING 22" REMOTE TV's from **£25**

★ COLOUR PORTABLE WORKING from **£60** ★

PHILIPS K30, KT3, G11 – TELETEXT/REMOTE
G11 FROM £18 – G8 FROM £5
PLUS ITT – GEC – BUSH – JAPS – DECCA ETC
ALL WITH EXCELLENT CABINETS

GRADE B TELEVISION
VIDEO – AUDIO & HI FI

HITACHI – FERGUSON
VIDEO HEADS IN STOCK

FURTHER DETAILS RING NOW!

ALL PRICES BASED ON QUANTITY & SUBJECT TO 15% VAT

EXPORT ENQUIRIES WELCOME

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01-884 1314

CENTRAL, Cedar House, Nobel Road, Eley Estate, Edmonton N18

N.B. PLEASE TAKE NOTICE THAT WE ARE NOT CONNECTED WITH M/S HUSSAIN, CENTRAL

£1 BAKERS DOZEN PACKS

Price per pack is **£1.00.*** Order 12 you may choose another free. Items marked (sh) are not new but guaranteed ok.

1. 5 – 13 amp ring main junction boxes
2. 5 – 13 amp ring main spur boxes
4. 5 – surface mounting light switches
5. 3 – electrical switches intermediate type, will also replace 1 or 2 way switches, white flush mounting
7. 4 – in flex line switches with neons
9. 2 – mains transformers with 6V 1A secondaries
10. 2 – mains transformers with 12V ½A secondaries
11. 1 – extension speaker cabinet for 6½" speaker
13. 12 – glass reed switches
17. 2 – ultrasonic transmitters and 2 receivers with circuit
19. 2 – light dependent resistors
25. 4 – wafer switches – 6p 2 way, 4p 3 way, 2p 6 way, 2p 5 way, 1p 12 way small one hold fixing and good length ¼ spindle your choice
28. 1 – 6 digit counter mains voltage
30. 2 – Nicad battery chargers
31. 1 – key switch with key
33. 2 – aerosol cans of ICI Dry Lubricant
34. 48 – 2 metre lengths colour-coded connecting wire
39. 1 – long and medium wave tuner kit
41. 8 – rocker switch 10 amp mains SPST
45. 1 – 24 hour time switch mains operated
49. 10 – neon valves – make good night lights
50. 2 – 12V DC or 24V AC, 3 CO relays
51. 1 – 12V 2 CO miniature relay very sensitive
52. 1 – 12V 4 CO miniature relay
54. 10 – rows of 32 gold plated IC sockets (total 320 sockets)
55. 1 – locking mechanism with 2 keys
56. 1 – miniature uniselector with circuit for electric jigsaw puzzle
60. 5 – ferrite rods 4" × 5/16" diameter aerials
61. 1 – Mullard thyristor trigger module
66. 1 – magnetic brake – stops rotation instantly
67. 1 – low pressure 3 level switch can be mouth operated
69. 2 – 25 watt pots 8 ohm
70. 2 – 25 watt pots 1000 ohm
71. 4 – wire wound pots – 18, 33, 50 and 100 ohm your choice
77. 1 – time reminder adjustable 1-60 mins clockwork
85. 1 – mains shaped pole motor ¾" stack – ¼ shaft
89. 1 – mains motor with gear box 1 rev per 24 hours
91. 2 – mains motors with gear box 16 rpm
96. 1 – thermostat for fridge
98. 1 – motorised stud switch (s.h.)
101. 1 – 2½ hours delay switch
102. mains PSU 9V
103. 1 – mains power supply unit – 6V DC
104. 1 – mains power supply unit – 4½V DC
107. 1 – 5" speaker size radio cabinet with handle
111. 2 – musical boxes (less keys)
112. 1 – heating pad 200 watts mains
114. 1 – 1W amplifier Mullard 1172
115. 1 – wall mounting thermostat 24V
118. 1 – teak effect extension 5" speaker cabinet
120. 2 – p.c. boards with 2 amp full wave and 17 other recs
121. 4 – push push switches for table lamps etc.
122. 10 – mtrs twin screened flex white p.v.c. outer
124. 25 – clear plastic lenses 1¾ diameter
127. 4 – pilot bulb lamp metal clip on type
128. 10 – very fine drills for pcbs etc.
129. 4 – extra thin screw drivers for instruments
132. 2 – plastic boxes with windows, ideal for interrupted beam switch
134. 10 – model aircraft motor – require no on/off switch, just spin to start
142. 10 – 4BA spanners 1 end open, other end closed
145. 2 – 4 reed relay kits 3V coil normally open or c/o if magnets added
146. 20 – pilot bulbs 6.5V 3A Philips
154. 1 – 12V drip proof relay – ideal for car jobs
155. 3 – varicap push button tuners with knobs
169. 4 – short wave air spaced trimmers 2-30f
172. 10 – 12V 6W bulbs Philips m.e.s.
178. 3 – oblong amber indicators with liliputs 12V
180. 6 – round amber indicators with neons 240V
181. 100 – p.v.c. grommets ⅜ hole size
182. 1 – short wave tuning condenser 50 pf with ¼" spindle
184. 1 – three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188. 1 – plastic box sloping metal front, 16 × 95mm average depth 45mm
193. 6 – 5 amp 3 pin flush sockets brown
195. 5 – B.C. lampholders brown bakelite threaded entry
196. 1 – in flex simmerstat for electric blanket soldering iron etc.
197. 2 – thermostats, spindle setting – adjustable range for ovens etc.
199. 1 – mains operated solenoid with plunger 1" travel
200. 1 – 10 digit switch pad for telephones etc.
201. 8 – computer keyboard switches with knobs, pcb or vero mounting
211. 1 – electric clock mains driven, always right time – not cased
216. 1 – stereo pre-amp Mullard EP9001
232. 2 – 12V solenoids, small with plunger
236. 1 – mains transformer 9V 1 amp secondary C core construction
241. 1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile
241. 2 – speakers 6" × 4" 4 ohm 5 watt made for Radiomobile
243. 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile
244. 1 – mains motor with gear-box very small, toothed output 1 rpm
245. 4 – standard size pots, ½ meg with dp switch
249. 1 – 13A switched socket on double plate with fused spur for water heater etc.
266. 2 – mains transformers 9V ½A secondary split primary so ok also for 115V
267. 1 – mains transformers 15V 1A secondary p.c.b. mounting
291. 1 – ten turns 3 watt pot ¼ spindle 100 ohm
296. 3 – car cigar lighter socket plugs
298. 2 – 15 amp round pin plugs brown bakelite
300. 1 – mains solenoid with plunger compact type
301. 10 – ceramic magnets Mullard 1" × 3/8 × 5/16
303. 1 – 12 pole 3 way ceramic wave charge switch
304. 1 – stereo amp 2W per channel
305. 1 – tubular dynamic microphone with desk rest
308. 1 – T.V. turret tune (black & white T.V.)
310. 2 – oven thermostats
313. 5 – sub miniature micro switches
316. 1 – round pin kettle plug with moulded on lead

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules – i.e. Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for £6.00 plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

CAR STARTER/CHARGER KIT

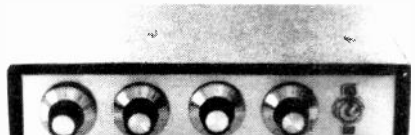
Flat Battery! Don't worry you will start your car in a few minutes with this unit – 250 watt transformer 20 amp rectifiers, all parts with data £15 case £4 p&p £2.

VENNER TIME SWITCH

Mains operated with 20 amp switch. One on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only **£2.95** without case, metal case – **£2.95**, adaptor kit to convert this into a normal 24hr. time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is **£2.30.**

Ex-Electricity Board. Guaranteed 12 months.

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by ¼" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is **£14.95** in kit form.

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3½" long by 3" dia. They have a good length of ¼" spindle –
1/10 hp **£3.45**
1/8 hp **£5.75.** 1/6 hp **£7.50**

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake – switch on lights to ward off intruders – have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at **£2.50**

THIS MONTH'S SNIP

400 Watt Mains Isolation Transformer 230 volts in 230 volts out. Supplementary 10 volt winding for voltage adjustments. Torroidal construction makes it most compact. Regular price £40. Our price **only £10.00** + £2 post.

MAKING SUNBEDS?

CHOKE AND STARTER for 6' 100uva tube **£2**, post £1 for 1 or 50p each in quantity.
TUBE HOLDERS Canopy type spring loaded, 4 pairs for **£1**, 100 pairs **£20**, 1,000 pairs **£150**, post paid.

TANGENTIAL HEATERS

We again have very good stocks of these quiet running instant heat units. They require only a simply case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1.2kw, 2kw, 2.5kw, and 3kw. Prices are **£5** each for the first 3, and **£6.95** for the 3k. Add post £1.50 per heater if not collecting.
CONTROL SWITCH enabling full heat, half heat or cold blow, with connection diagram, 50p for 2kw, 75p for 3kw.

FANS & BLOWERS

Woods extractors
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10" × 3" Tangential Blower. New. Very quiet – supplied with 230 to 115V adaptor on use two in series to give long blow **£2.00** + £1.50 post or **£4.00** + £2.00 post for two.

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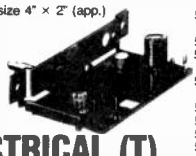
MINI MONO AMP on p.c.b. size 4" × 2" (app.)



Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.50 each, or 13 for £12.00**

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2P72 – 1 115v Muffin fan 4" × 4" approx. ex computer
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2P112 – 6 volt 200MA Voltage regulated PSU for 13 amp socket
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2P114 – 12 volt 200MA Voltage regulated PSU for 13 amp socket
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2P118 – 30rpm mains motor with gearbox
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5P23 miniature (appr. 2½" wide) tangential blow heater, 1.2kw
5P24 ¼hp motor, ex computer, 230v, mains operation 1450rpm, if not collect add £3 post
5P25 special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
5P27 cartridge player 12v, has high quality stereo amplifier
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5P34 24v 5A toroidal mains transformer
5P35 modern board from telephone auto dialler, complete with keypad and all ICs
5P37 24 hour time switch, 2 on/offs and clockwork reserve, ex. Elec. Board loading up to 50A. Add £1 post
5P41 5" extractor fan, very quiet runner sh, gntd 12 mths.
5P45 pack of 6 cooker clock switches
5P48 telephone extension bell in black case, ex-GPO
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5P52 mains transformer 26v 10A upright mounting, add £2 post
5P54 mains motor with gear box, final speed 5rpm
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5P62 2½kw tangential blow heater, add £1.50 post if not collecting
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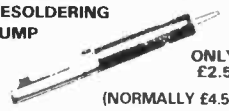

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BTT6218	1.98	TDA2532	2.80
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CA3065	1.00	UPC1182H	2.75
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LA4422	3.20		
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SN76227N	1.10		
SN76533N	1.70		
STK015	6.20		
STK032	13.00		
STK078	13.00		
STK435	8.99		
TA7146P	4.60		
TA7203P	2.50		
TA7204P	2.50		
TA7205AP	1.80		
TA7222P	2.32		
TAA550	0.50		
TAA611A12	4.50		
TAA621AX1	4.50		
TAD100	2.90		
TDA120A	1.20		
AS/S/SB/T/U	0.80		
TDA1208	1.30		
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TBA520	1.50		
TBA530	1.20		
TBA540	1.64		
TDA560C	1.50		
TBA810S	1.20		
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TDA1003A	5.50		
TDA1006A	2.45		
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7815	0.45		
7818	0.45		
7824	0.45		
7905	0.50		
7912	0.50		
7915	0.50		
7918	0.50		
7924	0.50		
78H05	5.60		
78H12	6.40		
LM305H	1.48		
LM317K	2.40		
LM317T	1.25		
LM723	0.65		

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Type	Price (£)	Type	Price (£)
AC127	0.28	BC118	0.16
AC128	0.30	BC119	0.28
AC128K	0.34	BC125	14
AC141	0.58	BC140	0.27
AC141K	0.38	BC141	0.24
AC142	0.56	BC142	0.24
AC142K	0.38	BC143	0.26
AC151	0.45	BC147	0.18
AC152	0.45	BC147B	0.14
AC153	0.57	BC148	0.10
AC153K	0.46	BC148B	0.12
AC176	0.30	BC149	0.10
AC176K	0.38	BC149C	0.14
AC187	0.28	BC157	0.10
AC187K	0.38	BC158	0.12
AC188	0.28	BC159	0.12
AC188K	0.38	B/C	0.14
ACY22	1.50	BC160	0.30
AD142	0.88	BC161	0.30
AD143	1.10	BC168B	0.20
AD149	0.72	BC169C	0.12
AD161/162	1.20	BC170/A/B/C	0.16
AD162	0.52	BC171/A/B	0.10
AF114	1.20	BC172/B/C	0.12
AF115	2.10	BC177/A/B/C	0.24
AF116	2.10	BC182/A/B/C	0.10
AF121	0.56	BC182L	0.12
AF124	0.42	LA LD LC	0.10
AF125	0.58	BC183/A/B/C	0.10
AF126	0.58	BC183L	0.10
AF127	0.38	LA LB LC	0.10
AF139	0.40	BC184	0.10
AF178	2.28	A B CL LC LB	0.10
AF239	0.50	BC207	0.15
AF279S	1.40	BC212/A/B/C	0.10
ASY80	5.20	BC212L	0.09
ASZ17	2.00	LA LB	0.10
AU110	2.80	BC213/A/B/C	0.10
AY102	4.40	BC213L	0.10
B40C200	1.03	LA LB LC	0.10
BA110	0.68	BC237	0.11
BA115	0.14	BC238	0.12
BA121	0.40	BC251/A/B	0.14
BA129	0.38	BC262	0.20
BA148	0.16	A B	0.28
BA155	0.12	BC301	0.30
BA157	0.28	BC302	0.30
BB105B	0.30	BC303	0.30
BB105G	0.48	BC307A	0.18
BB110B	0.42	BC317A	0.12
BC107	0.10	BC323	0.90
A or B	0.12	BC327	0.16
BC108	0.10	BC328	0.16
A,B or C	0.13	BC337	0.12
BC109	0.10	BC338	0.12
A,B or C	0.14	BC350A	0.24
BC115	0.12	BC351	0.16
BC116	0.12	BC440	0.36
BC117	0.22	BC441	0.40
		BC461	0.58
		BC478	0.24

Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
BC516	0.48	BF178	0.26	BU126	1.40	ORP12	0.95
BC547	0.12	BF180	0.27	BU133	1.90	R2008B	1.20
A or B	0.10	BF181	0.27	BU204	1.30	R2010B	1.20
BC548	0.12	BF182	0.32	BU205	1.30	R2540	2.71
A B or C	0.10	BF183	0.32	BU206	1.50	TIP30A	0.32
BC549	0.10	BF184	0.30	BU208A	1.40	TIP31C	0.39
A or B	0.10	BF185	0.28	BU326S	1.75	TIP32	0.35
BC550	0.10	BF194A	0.15	BU407	1.10	TIP33A	0.55
A or B	0.10	BF195	0.12	BUX80	3.70	TIP34A	0.70
BC557	0.10	BF224J	0.20	BUY20	2.75	TIP41C	0.42
BC558A	0.10	BF240	0.30	BUY69A	2.60	TIP42	0.44
BCY70	0.16	BF241	0.30	BUY69B	1.98	TIP47	0.42
BCZ10	3.21	BF244A	0.30	BY100	0.80	TIP121	0.63
BCZ11	2.60	BF257	0.22	BY103	0.50	TIP2955	0.70
BD124P	0.70	BF258	0.26	BY122	0.60	TIP3055	0.58
BD129	0.90	BF259	0.30	BY126	0.10	TIS88	0.50
BD130Y	0.68	BF262	0.34	BY127	0.08	TIS90	0.27
BD131	0.36	BF263	0.38	BY133	0.06	Y728	0.14
BD132	0.36	BF270	0.30	BY135	0.35	Y969	2.80
BD135	0.26	BF271	0.28	BY164	0.45	IN4001	0.04
BD136	0.26	BF273	0.22	BY179	0.56	IN4003	0.05
BD137	0.28	BF274	0.34	BY182	0.80	IN4004	0.05
BD138	0.30	BF294	0.46	BY184	0.38	IN4006/7	0.07
BD139	0.30	BF336	0.32	BY187	0.65	IN4148	0.04
BD140	0.28	BF337	0.28	BY189	6.75	IN5400	0.12
BD142	1.26	BF338	0.28	BY198	0.64	IN5402	0.13
BD145	1.82	BF355	0.37	BY199	0.72	IN5405	0.16
BD150A	0.72	BF371	0.27	BY206	0.14	IN5406	0.17
BD160	1.58	BF450	0.38	BY207	0.16	IN5408	0.19
BD165	0.45	BF457	0.36	BY210/400	0.21	2N2122A	0.34
BD183	0.70	BFR51	0.36	BY210/600	0.24	2N2222	0.30
BD201	0.52	BFR61	0.32	BY210/800	0.28	2N2904A	0.48
BD202	0.57	BFR90	0.86	BY227	0.22	2N2926G	0.14
BD204	0.50	BFT41	0.68	BY228	0.46	2N3053	0.30
BD222	0.80	BFT43	0.86	BY238	0.65	2N3054	0.60
BD225	0.40	BFY50	0.22	BYX10	0.20	2N3055	0.65
BD232	0.45	BFY51	0.22	BYX36/150	0.40	2N3703	0.10
BD234	0.30	BFY52	0.22	BYX36/600	0.48	2N3773	2.80
BD235	0.30	BFY90	0.80	BYX48/300	0.70	2SB337	1.80
BD236	0.38	BFY90S	1.34	BYX55/600	0.30	2SC1098	0.84
BD237	0.38	BR100	0.25	BYX71/600	1.18	2SC1172Y	1.70
BD410	0.76	BR101	0.40	C106D (400V)	0.48	2SC1173Y	0.88
BD434	0.58	BR103	0.50	E1222	0.30	2SC1279	0.50
BD438	0.58	BR303	2.75	E5024	0.30	2SC1306	0.92
BD439	0.85	BRY39	0.50	MCR106/5	1.20	2SC1413A	2.70
BD441	1.00	BRY56	0.42	ME0413	0.70	2AC1449	0.60
BD507	1.05	BSX20	0.30	ME6002	0.26	2SC1507	0.60
BD520	1.20	BSY52	0.35	MEU21	0.62	2SC1678	1.00
BD687	0.88	BSY95A	0.25	MJ400	0.45	2SC1758	0.68
BD707	0.88	BT100A/02	0.90	MJ2955	1.00	2SC1909	1.20
BDX18	1.00	BT101/300	2.75	MJ3000	1.80	2SC1923	0.30
BDX32	1.48	BT101/500	3.25	MJE340	0.46	2SC21953	0.70
BF115	0.32	BT102/300	3.60	MJE520	0.44	2SC1957	0.70
BF117	0.50	BT106	1.15	MJE2955	1.60	2SC1969	2.80
BF119	0.82	BT116	1.20	MJE3055	1.40	2SC2028	0.73
BF120	0.38	BT119	3.30	MPSA05	0.30	2SC2029	2.70
BF125	0.42	BT138/600	1.30	MPSA12	0.30	2SC2078	1.05
BF127	0.41	BT151/560R	0.90	MPSLO1	0.34	2SC2091	0.70
BF154	0.14	BTY79/400R	2.80	MPSUO5	1.05	2SC2098	2.90
BF157	0.46	BU104	1.80	MPSUO6	1.18	2SC2122A	3.20
BF160	0.23	BU105	1.20	MR502	0.40	2SC2314	0.80
BF167	0.32	BU108	1.75	MR854	0.88	2SC2335	1.50
BF177	0.42	BU124AE	0.98	OA91	0.07		

VALVES

Enquiries are welcomed for any other valve not listed here.

Type	Price (£)
AZ31	4.50
AZ41	1.98
DAF96	1.00
DF96	0.75
DK96	2.65
DM71	2.95
DY86/87	0.66
DY802	0.95
CV850	2.50
CV4015	2.80
E180F	6.50
EABC80	0.98
EAF42	1.50
EB91	1.30
EBC41	2.00
EBF80	0.75
ECC81	1.00
ECC82	0.90
ECC83	1.00
ECC84	0.80
ECC85	0.95
ECC88	1.25
ECC189	0.85
ECF80	1.20
ECF82	0.85
ECF83	1.90
ECH35	3.75
ECH81	1.40
ECH84	1.50
ECL85	0.75
ECL86	1.75
EF80	0.75
EF86	1.80
EF91	2.00
EF95	1.68
EF183	0.90
EF184	1.00
EH90	0.98
EL34	3.25
EL36	2.25
EL81	6.95
EL84	1.00
EL85	4.75
EL86	0.90
EL509	7.85
EL519	7.95
EM80	0.85
EM84	1.75
EM87	2.55
EY51	0.90
EY86/87	0.65
EY88	0.75
EY500A	2.50
EZ41	2.80
EZ81	0.80
GY501	1.40
GZ32	1.20
KT66(G.E.C.)	18.00
KT77	11.50
KT88(G.E.C.)	19.00
PC88	1.40
PC92	3.00
PC900	1.40
PCC88	0.80
PCC89	0.75
PCC189	0.85
PCF80	0.95
PCF82	0.95
PCF84	0.75
PCF86	1.25
PCF87	0.50
PCF200	1.95
PCF201	1.95
PCF800	1.20
PCF801	1.05
PCF802	1.05
PCF805	2.00
PCF806	1.20
PCF808	1.60
PCL82	1.00
PCL83	2.50
PCL84	1.00
PCL86	0.90
PCL88	2.50
PCL805	1.05
PD500	2.90
PFL200	1.85
PL33	1.50
PL36	1.75
PL82	0.75
PL95	2.00
PL504	1.50
PL508	2.70
PL519/509	5.25
PL802	5.50
PY81/800	1.10
PY82	1.75
PY88	0.80
PY500A	2.20
PY801	0.68
UABC80	0.85
UAF42	1.25
UBC41	3.00
UBC81	1.50
UCC85	0.75
UCF80	1.20
UCH42	2.50
UCH81	2.00
UCL82	1.80
UCL83	1.80
UF41	1.25
UF89	2.50
UL84	1.25
UY85	1.15
2D21	1.60
6AT6	1.25
6AU6	1.00
6C4	1.00
6GH8A	1.20
6J5GT	2.50
6K7G	2.00
6K8G	2.75
6KD6	6.50
6X4	1.50
30FL2	1.70
30FL12	1.60

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	1500 150+150+100/300V	2.40
	3000 1000/63V	0.90
	3500 175/400V+100+100/350V	3.00
	8000 400/350V	2.65
	8000/8500 2500+2500/63V	2.25
	8000 700/250V	2.50
	1000/70V	0.90
	9000 400/400V	3.50
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DECCA 10/30	400+400/350V	3.70
	1700 200+200+400/350V	4.90
GEC	2047 2000 2083 2084 2104	
	200+200+150+50/300V	2.90
	600/250V	2.40
ITT/KB	200+200+75+25/350V	3.00
	220/400V 3 tag	2.10
PHILIPS	G8 600/300V 2 tag	2.50
	G8 G9 600/250V	2.40
	G11 470/250V	3.10
	G9 2200/63V	1.35
EKCO 691	200+300/350V	4.50
Series	600/300V	3.50
RANK	300+300/300V	3.75
A823	2500+2500/30V	1.65
	220/400V	2.20
	600/300V	3.10

FULL RANGE IN CATALOGUE

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GEC2010	8R + 15R + 17R + 70R + 63R + 188R	0.95
GEC 2018	10R + 15R + 19R + 70R + 188R	1.15
Philips G8	2.2R + 68 R	1.00
Philips 70	6R + 124R + 84R	0.68
Philips 300	118R + 148R (with link)	1.35
RRI A640	250R + 14R + 156R 50W	1.05
RRI A816	302R + 70R + 6.2R	0.78
Thorn 1500	350R + 20R + 148R + 1.5K + 317R	1.34
Thorn 3000/3500	6R + 1R + 100R Fused	1.05
Thorn 8000	56R + 1K + 47R + 12R	0.95
Thorn 8500	1K5 + 40R + 50R	1.28

Plus Many More. Please enquire.

RESISTORS – CARBON FILM 5%

¼W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
½W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
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2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

RESISTOR KITS,– each value individually packed

¼W pack 10 each value E12 – 10R to 1M 610 pieces	5.75
¼W pack 5 each value E12 – 10R to 1M 305 pieces	3.35
½W pack 10 each value E12 – 2R2 to 2M2 730 pieces	7.95
½W pack 5 each value E12 – 2R2 to 2M2 365 pieces	4.75
1W pack 5 each value E12 – 2R2 to 1M 353 pieces	15.25
2W pack 5 each value E6 – 10R to 2M2 317 pieces	18.50

RESISTORS – WIREWOUND. Generally 5%

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4W – 1R0 to 10K – Available in preferred values	0.18
7W – 0.47R to 22K – Available in preferred values	0.15
11W – 1R0 to 22K – Available in preferred values	0.18
17W –1R0 to 22K – Available in preferred values	0.24

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CS 18W, as above	10.90
Antex 15W iron	5.75
Antex 18W iron	5.95
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Antex elements	3.20
Antex bits	0.99
Antex stands	2.20
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Spare nozzles for Soldersucker	0.65

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400mW Plastic 3V–75V
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1.5W Flange 4.7–47V
2.5W Plastic 7.5–75V
20W Stud 7.5–75V

8p each. 10/75p
15p each. 10/£1.40
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64p each*
£1.35 each*
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CERAMIC KIT 50 VOLT 5 ea value – 125 Caps £4.75

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CM7253	13.66
CM7243	12.72
CM7093	16.03
CM9700	4.45
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CM7042	3.09
CM9006	3.78

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Circuit Freezer	1.41
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Aero Klene	1.13
Plastic Seal	1.35
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Antistat Spray	1.25
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FUSES Prices per 10

20mm Quick Blow. 100, 125, 160, 200, 250, 315, 400, 500, 630, 800mA, 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A. **45p. 20mm Time Delay.** 100, 125, 160, 200mA, 250, 315, 400, 500, 630, 800mA **90p.** 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A **70p. 1" Mains.** 2, 3, 5, 7, 10, 13A **90p.**

VIDEO HEADS

AKAI	ALL	39.44
HITACHI	VT5000E	37.99
JVC	ALL	39.44
NAT/PANASONIC	ALL VE/ and NV	39.44
SANYO	ALL	46.22
SHARP	VC7300/7700/7750/8300/2300	57.75
	VC6300/387/3300/9700/381/383/386/388/482/9100/9300/9500	53.50
SONY	LLC 9UB	46.65
	SLC 20/30/40	40.44
	SLC 5/6/7UB	39.11
	SL8000UB	48.40
TOSHIBA	ALL	48.66

VIDEO BELT KITS

NAT/PANASONIC	VDB01	2.05
JVC HR 7700	VDB02	.40
HITACHI VT 5000E	VDB03	1.50
JVC HR 3360/HR3660	VDB04	4.10
SONY SLC7	VDB05	3.75
JVC HR3300/HR3320/HR3330/HR3600	VDBo6	4.65
SONY SL8000	VDB07	6.75
NAT/PANASONIC NV8600	VDB08	1.55
SONY SLT-7ME	VDB10	.98
SONY SLT-9ME	VDB11	.98
TOSHIBA V5470	VDB12	1.45
TOSHIBA V5475	VDB13	1.56
TOSHIBA V8600	VDB14	4.50
NAT/PANASONIC NV300	VDB15	2.05
SANYO 5500	SANYO-012	2.05
SANYO 9300	SANYO-013	2.05
SHARP VC381	SHARP-020	3.15
SHARP C6300	SHARP-021	6.00
SHARP VC7300	SHARP-023	3.90
SHARP VC9300	SHARP-024	3.30
SHARP VC9700	SHARP-025	2.65

IDLER KITS/ASSEMBLIES

SHARP NIDL-0005 GE ZZ 0006	SHARP-0012	3.05
	SHARP-0013	3.05
SONY SLC5/7UB	IK-01	5.85
SONY SLC6UB	IK-02	4.70

SERVICE MANUALS

FIDELITY CTV 145/CTV140/R/CTV 2022	ALL	1.85
SONY HMK3000		2.45
SONY KV1810UB Mk.1/KV1400UB	ALL	8.15
SONY KV2000/KV1820/KV2204	ALL	8.35
SONY KV2212/KV2705/KV2252	ALL	5.85
SONY SLC5UB/SLC6UB/SLC7UB/SLC9UB	ALL	9.20

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BT App Telephone Plug + 3m Lead	£1.25
BT App Master Socket inc Wiring instrns	£2.85
BT App Secondary Socket	£1.95
4-way plug	30p each
BT 4-Core Cable per metre	15p/m
	£12.00/100m
Cable clips for above	100/75p

TV TX9	33.00
TV TX10	45.80
TCE 1690/1681	3.75
TCE 1790	1.25
TCE 9600	11.40
TCE 9800	8.65
VCR 3V00	19.90
VCR 3V01	23.75
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VCR 3V23	30.60
VCR 3V24	28.40
VCR 3V25/26	18.65
VCR 3V29	29.00

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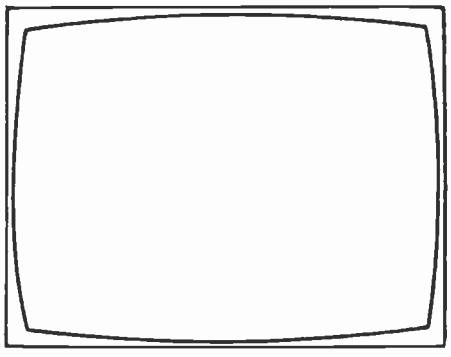

TELEVISION

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COVER PHOTO
This month's cover photograph shows a Sony manufactured 8mm video deck. See new series starting on page 406.

Spares Guide

This time last year we published our first TV/VCR Spares Guide. It proved to be a very popular feature, so this month we are repeating the exercise. When we set out to check on the current situation we knew that a number of changes would be required. In the event we were amazed at the extent of the amendments necessary. It's a fast moving field.

Most established setmakers have stayed put of course, though Thorn's service division headquarters will be moving during the next few months – there's as yet no firm date for the relocation to Enfield. The problems arise to some extent from the continuing high level of imports. Agents come and go or switch around and even major brands are affected. Thomson for example is not at present represented in the UK though new arrangements are being negotiated. During the year we've traced the agents for a number of less well known makers and brands – our thanks to all those readers who have helped with the requests for information appearing on this page from time to time. As a result we've managed to extend the list somewhat. We've also this time included a number of spares distributors. Some of them have a strict trade only policy, others are happy to deal with the public directly. Some brands continue to cause problems. There are at present no agents for Crown for example, once a major Japanese presence in the UK. Indesit sets also lead to many enquiries – the 12in. monochrome portables sold in large quantities here about ten years ago. Unfortunately Indesit withdrew from the consumer electronics field some years back and stocks of original spares are no longer held in the UK or in Italy. HRS and maybe some other component distributors list some spares, but not the LOPT for the monochrome portables which employed the unusual transistor pump regulation arrangement. For Saba spares you have to send requests to W. Germany. And so the sorry tale continues.

It's not easy even for those in the trade to keep track of all the brands on sale and their sources. As a result of the highly competitive High Street conditions many retail chains have been making their own import arrangements. Since the products involved are not generally available to retail outlets details are not notified to the trade – but inevitably some of the sets eventually end up being brought to dealers for repair. Mail order firms are also increasingly active in the domestic electronics field. There are instances – Orion for example – where different models have been imported by different agents at different times: who has what, if at all, by way of spares is quite a problem. In other cases, for example the at present dormant Waltham brand, the products have come from varied sources in E. Europe, the Far East and elsewhere. All this amounts to quite a headache for the servicing trade. We shall continue to include changes of addresses, agencies etc. in Teletopics as they come to our attention.

The Incredible Portable Company

We have commented in this column and Teletopics in recent months on the increasing problems faced by Japanese consumer electronics manufacturers – and others of course – as a result of the substantial rise in the value of the yen. This revaluation has made Japan a high-cost manufacturing base and to remain competitive Japanese manufacturers have increasingly come to depend on off-shore production facilities, either in low-cost Far Eastern countries or close to major markets, i.e. in Europe and North America. Fear of possible protectionist policies has led to many manufacturers adopting the latter course over the years.

The *Financial Times* reported recently on the strange case of Aiwa, which was established in 1951 and became a major international brand as the Japanese came to dominate the audio field in the sixties and seventies. Sony owns over fifty per cent of Aiwa, which gives Aiwa access to Sony technology. Aiwa's recent history has not been happy. 1985 was a sluggish year and 1986 turned out to be something of a disaster, aggravated by the yen problem. Sales fell by 25 per cent in 1986 and a substantial loss was made. To assist with the problem Sony installed its managing director of overseas sales as deputy president of Aiwa.

Aiwa's first move when sales started to decline and stocks mounted had been to cut production at its overseas plants – in Singapore and Gwent, Wales – the aim being to protect jobs at its two Japanese plants. This left Aiwa particularly exposed when the value of the yen soared late last year. Enter Sony's Hajime Unoki, who apparently took just three weeks to assess the situation and conclude that the policy would have to be reversed if Aiwa was to continue in business. The first step was to cut production and employment in Japan, the second to increase off-shore production in Singapore. The latter step required a new production site in view of the cramped conditions at Aiwa's existing plant there. Aiwa took just three and a half months to renovate an old warehouse. A further six weeks were required to instal production equipment – the Japanese assembly lines were dismantled, loaded on to aircraft and reassembled in Singapore. Within seven months Aiwa's worldwide production had been fully restored, with exquisite timing – the initial steps had been taken before the full effects of the revalued yen had become apparent to much of Japanese industry.

Aiwa has had a lucky reprieve, though its previous employees are left out on a limb. But what one has to ask is whether this sort of thing should be necessary. Economic policies worldwide have led to instability in financial markets. It's employment that eventually suffers. A root and branch rethink of economic policy making is long overdue.

Long-distance Television

Roger Bunney

Conditions during January were better than we normally experience at this time of the year. The Quadrantids meteor shower produced some very good signal pings over the period January 3-4th: there were some very strong and sustained signals at frequencies up to the low end of Band III. Since the ionisation produced by meteor showers occurs at E layer height the signal distances are 500-1,200 miles, producing signals from all over Europe. Some of the more intense and sustained signals can, in the case of "super pings", last for up to thirty seconds, which makes it possible to confuse them with SpE reception. Care is required over correct identification.

The weather in the UK during January was dominated by the intense cold and snow. A virtually static high-pressure system during the first two weeks gave rise to enhanced tropospheric conditions: Band III/u.h.f. signals from W. Germany just reached the south/south east of the UK, though the conditions couldn't be described as an opening.

A second and more intense spell of tropospheric activity occurred between January 30th and February 1st, peaking on the 31st. Again a well-placed high-pressure system produced Band III/u.h.f. signals. Reports of reception during this period are still coming in, but it seems that excellent reception from west and east Germany, Denmark, Belgium, Holland, France and Luxembourg was logged at relatively high signal levels across the UK and into Wales. For example, Simon Hamer at New Radnor logged many Band III/u.h.f. signals including TF1, A2, FR3 and Canal Plus from France; BRT/RTBF from Belgium; Luxembourg RTL+; Denmark DR; Holland NED1 and NED2; ARD, WDR, NDR and ZDF from W. Germany; and E. Germany DFF. I found that Band III was particularly active here at Romsey, South Hampshire. Rain on the mid-afternoon of February 1st put an end to this reception.

Sporadic E signals were noted on several days as follows:

5/1/87 TSS (USSR) ch. R1.
18/1/87 NRK (Norway) E2.
23/1/87 SR (Sweden) E2.
25/1/87 SR E2.
26/1/87 ARD E2; +PTT (Switzerland) E2; TVP (Poland) R2.

Iain Menzies in Aberdeen noted auroral signals on the 5th, 7th, 10th, 16th and 17th.

Despite the weather, an encouraging start to 1987!

Robert Copeman and Todd Emslie report excellent SpE and tropospheric reception in Australia. Todd received Malaysia ch. E2, a distance of 3,500 miles, on January 7th, together with v.h.f./f.m. radio signals from New Zealand and New Caledonia. At the end of December Robert received TV station RTS from Loxton, S. Australia (ch. A5A) via tropospheric propagation in the Melbourne area: perhaps more dramatic was his possible reception of AFAN-FM, McMurdo Sound, Antartica at 100·1MHz on January 1st via SpE propagation.

News Items

UK: It appears that Network 21, the ch. 21 pirate TV station in Brixton, London, is off air at present. A return with increased air-time is planned for the early summer, with the emphasis on current affairs and rock. Any further information would be appreciated. The 1987 TV/ILR transmitter pocket guide is available free from the Engineering Information Service, IBA, Crawley Court, Winchester, Hants SO21 2QA – a foolscap stamped s.a.e. should be enclosed with requests for this.

USA: On December 5th WUSA-TV, Washington transmitted wideband high-definition TV over the ch. A58-59 spectrum. This caused conflict between the NAB and the FCC. The latter intend to give part of the TV u.h.f. spectrum to the land mobile service: the NAB has challenged this move, arguing that the loss of TV spectrum space could prejudice the development of HDTV.

Eastern Europe: Polish TV-2 outlets in the OIRT Bands I and II are to be transferred to u.h.f. this spring: within five years the TVP-1 transmitters in Band I/II and the f.m. radio transmitters in the 65-73MHz band will move to u.h.f. and the CCIR Band II respectively. The "ODK" identification used on the FUBK test pattern from Prague, Czechoslovakia stands for "Odbavovaci Komplex", indicating origination at the Prague central network control centre. A ch. R41 Prague relay is to be used to transmit TSS-1 (USSR) at some 100kW e.r.p.

TVRO Equipment Security

Mention was made last month of the theft of a Luxor 11GHz TVRO system in Kent. The outside part of the

Left: Caption transmitted on the last day of the Europa Television satellite TV service. Centre: G4ZEK ATV station received in Holland, transmitting at 435MHz. Right: G4RNA, Sheffield, received in Holland on the 435MHz band. All photos from Ryn Muntjewerff. The ATV signals were received during the good tropospheric period at the end of November 1986.

installation, which originally cost some £2,300, consisted of a 6ft dish and polar mount with actuator, polariser and LNB, mounted on a 4ft steel tube concreted into the ground. While the owner was away the assembly was unbolted from the steel tube and apparently manhandled over a fence. Property insurance through a well-known company did not cover satellite equipment installed in the garden, nor did it include the receiver itself which was indoors and was not involved. It appears that satellite receiving equipment, unlike video equipment, is not at this time covered by a normal household contents policy. It's possible to take out a separate policy to cover satellite equipment installed indoors/outdoors but the premiums are high and positive security measures to prevent the terminal or parts of it being removed have to be provided.

One TVRO retailer is known to be developing a security device that will set off an alarm if the feeder cable(s) to the external system are cut or removed. At least two external TVRO installations have been stolen recently in the Kent area, which implies that there's an interest and probably a market in second-hand equipment of this type. If you're thinking of buying a TVRO terminal it might be wise to check with your friendly local insurance company or broker first! Obviously if anyone hears about a stolen Luxor system as outlined above we'd like to know.

Multi-standard TV Receivers

Back in the sixties the choice of equipment for TV-DXing was very limited. The enthusiast had to modify 405-line equipment to cater for negative-going vision signals and 625 lines. With the advent of dual-standard (system A/I) receivers matters were considerably eased and some sets could be modified to give switched selectivity (wide/narrow vision i.f. bandwidths). The advantage of a narrow i.f. bandwidth is considerable when trying to resolve weak SpE signals under congested band conditions. Enthusiasts who opt for colour DX reception generally have to accept the standard wide i.f. bandwidth, but results can still be dramatic given a stable signal within the channel bandwidth, via either SpE or tropospheric propagation. Personally I prefer to use a reduced i.f. bandwidth in the interests of optimal reception under less than ideal conditions throughout the year, though this means monochrome reception only and the need to modify and/or build equipment. Readers who require variable bandwidth operation can refer to the constructional articles published in the February-April 1982 issues of this magazine or purchase the D100 system available from HS Publications, 7 Epping Close, Derby DE3 4HR. The advantage of using an outboard system is that the signals can be processed and then fed to a standard system I u.h.f. receiver.

An alternative though perhaps more costly approach is to purchase a multi-standard receiver. It's perhaps worth mentioning that under selective fading conditions, i.e. the signal level varying within the channel bandwidth, the result will be monochrome reception and lack of sound. Such variations are more marked with SpE fading than with the much slower fading experienced with tropospheric propagation.

Various imported multi-standard receivers are available from companies such as Aerial Techniques and Portatel Conversions (Sunbury), plus of course various dealers in the Tottenham Court Road area of London. As a guide to what's available details of some of the more popular multi-standard receivers are given in the following list.

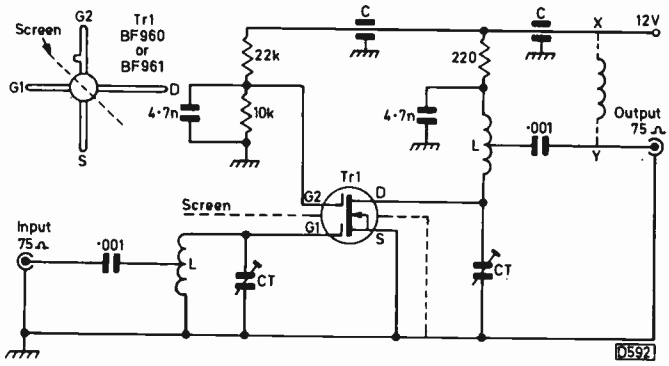

Fig. 1: MOSFET Band III preamplifier circuit designed by Philippe Bouchard. The trimmers are 2-10pF subminiature types. All resistors 1/5W metal oxide. Coils L consist of four turns of 22-26g wire, 1/4in. diameter, tapped 1 1/2 turns from the "dead" end. The v.h.f. choke (if required for powering) consists of 12 turns of 30g enamelled copper wire, close-spaced 1/8in. diameter, self-supporting.

Prices are generally in the £300-£500 range. All the sets listed are colour ones, but we understand that a new version of the Yoko 5in. monochrome receiver should be available shortly: this will provide switched reception of standards B/G, I and L at below £100.

Grundig

Models P40-242/90MS (15in. c.r.t.) and P55-245/9MS (21in c.r.t.). Standards: PAL B/G, I, D; SECAM B/G, L, D/K; NTSC 3·58MHz (4·5 and 5·5MHz sound) and NTSC 4·43MHz. VHF/UHF operation including the S channels. Infra-red remote control. 29 + 2 channel memory. Scart connector. Accessories include teletext, viewdata, 12/24V unit. Sound jack fitted.

Salora

Model L30. Standards: PAL B/G, I and SECAM L. VHF/UHF coverage including the S channels. 30 channel memory. 15in c.r.t. Scart connector. Infra-red remote control. Sound jack fitted. Accessories include teletext, 12/24V unit.

JVC

Model CX-60GB. Standards: PAL B/G, I; SECAM B/G, D, K. VHF coverage E2-R5 and E5-E12, UHF coverage E21-E69. 6in. c.r.t. Operates with 12V d.c. or 110-240V a.c. mains supply. Audio/video input/output sockets. Accessories include rechargeable battery pack.

Model C-140KM. Standards: PAL B/G, I, D; SECAM B/G, D, K; NTSC 3·58/4·43MHz. Coverage as Model CX-60GB. 14in. c.r.t Remote control. 30 channel memory plus scanning. On-screen display of control settings. Switch-on timer. 120-240V a.c. operation.

Model AV-20GB. Standards: PAL B/G, I, D; SECAM B/G, D; NTSC 3·58/4·43MHz. Coverage as Model CX-60GB. Stereo capability. 20in. c.r.t. Remote control. Audio/video outputs, three pairs audio/video inputs. 110-240V a.c. operation.

Model 7755GB. Standards (with auto-selection): PAL B/G, D, I; SECAM B/G, D; NTSC 3·58/4·43MHz. Coverage as for Model CX-60GB. 20in. c.r.t. Audio in/out via 5-pin DIN socket, video in/out via BNC socket. On-screen display. Timer.

Model C-2155KM. Standards: PAL B/G, I, D; SECAM B/G, D; NTSC 3·58/4·43MHz. Coverage as for Model CX-60GB. 21in. c.r.t. Audio in/out via 5-pin DIN socket, video in/out via BNC socket. On-screen display. Timer.

Model C-210KM. Standards: PAL B/G, I, D; SECAM B/G, D, K; NTSC System M. Coverage as Model CX-60GB. 21in. c.r.t. 30-channel memory. Audio in/out via phono sockets, video in/out via BNC socket. On-screen display. Timer.

Wideband Band III Preamplifier

The French TV-DX club ATAFELD recently published details of an interesting Band III MOSFET preamplifier designed by Philippe Bouchard. The circuit is shown in Fig. 1 and is straightforward, giving a gain of around 20dB at 75Ω with a noise figure of less than 2dB. Devices such as the BF900, BF960 or BF961 can be used with a 12V power supply, the current drawn being typically 20mA. It's best to build the circuit on fully coated PCB or copper: as with all v.h.f./u.h.f. circuits the lead lengths must be kept minimal to avoid losses and maintain h.f. operation. The MOSFET transistors are obtainable from such advertisers in the magazine as Grandata Ltd. (Wembley) and GGL Components (Carlisle). It should be possible to build the amplifier for well under £2 and to achieve a really upmarket performance. For remote operation the amplifier can be powered via the downlead: connect a v.h.f. choke (12 turns of 30g enamelled close-spaced wire, 1/8in. diameter, self-supporting) between points X and Y.

405-line Corner

Reader Philip N. Dick of 280 Old Marylebone Road, London N20 has for disposal to a good home a 1953-vintage HMV TV set, Model 1824A, in good working order. He also has for disposal a small collection of TV/radio valves and a complete set of *Practical Electronics* magazines (mostly in binders) from 1964 to date.

Book Review

"Newnes Television and Video Engineer's Pocket Book" by Eugene Trundle, published by William Heineman Ltd., London, at £9·95. 323 pages.

In a fast-moving field such as TV/video it's not always easy to lay your hands on the information you require. So often reference to established books fails to produce enlightenment simply because the information you want is too "new". A thoroughly up-to-date reference book on domestic TV/video systems is very welcome therefore, and this book fulfills its aims admirably. The range of subject matter covered is astonishing for a modestly sized book – it includes various types of switch-mode power supply, cameras in some detail, both VCRs (of course) and video disc systems, videotext systems and modern remote control arrangements, colour coding, standard socket arrangements and so on. The author runs a busy service department and is well aware of the problems faced by TV/video service engineers. As a result the selection of information is aimed at what you may well need to refer to in practice, and comes with guidance on servicing and setting up procedures. The writing is clear – one never has to puzzle over what's meant – and the diagrams to the point (though some are a bit on the small side). I'm sure that this book will serve as a handy practical reference source and will not stray far from the workbench. For a limited period it's available as a special introductory offer (£8·95) from Paul Richards Books, 28 Boscobel Road, St Leonards-on-Sea, East Sussex. **J.A.R.**

Test Report: Taylor TD23 DMM

Eugene Trundle

Digital test equipment is becoming more widespread – some new oscilloscope designs even use dot-matrix display panels rather than c.r.t.s. Digital multimeters have been in use in the servicing trade for well over a decade now, and as recent visits to a number of other service departments have shown me they are becoming the norm for radio, TV and VCR servicing. So much so that the dial-and-pointer analogue meter is rapidly being ousted – when we wanted to buy a high-impedance analogue meter recently, the solid-state equivalent of a valve voltmeter, we were unable to find one for sale!

Digital Meters: Pros and Cons

Digital multimeters have much to commend them in comparison with analogue types. For the same degree of quality they are cheaper; much more accurate; more rugged, both physically and electrically; in general more compact; their high input impedance doesn't significantly load the circuit under test; there's no possibility of parallax error, while the angle at which the instrument lies has no effect on the readout; the voltage and current ranges usually go lower than their analogue counterparts; and they are less susceptible to overloads in terms of steady voltages and currents.

On the debit side digital meters can sometimes give confusing readings when the applied voltage or current is varying or has a superimposed ripple; they don't lend themselves to such tricks as "ballistic" tests of capacitors on the resistance ranges; and they are perhaps more vulnerable to breakdown if a very large pulse waveform is accidentally applied. Also they depend on an internal battery!

The TD23

It pays in the long run to buy good quality test equipment. The Taylor range can certainly be so described – it comes from the same stable (Thorn EMI Instruments Ltd.) as AVO and Megger. The TD23 DMM, which can be hand-held or sat on the bench, has been selected as particularly appropriate for TV and VCR servicing: it has a large 3½ digit, 1·2cm (0·5in.) LCD readout, wide ranges in all modes, and a useful "eyes-off" buzzer-type continuity testing facility. It's compact enough to slip into a pocket or toolbox for field servicing while being accurate and versatile enough for use in precision testing on the bench. Table 1 lists its main characteristics. Other similar meters are available in the Taylor range, notably the hand-held, probe-type autoranging TD20, and the TD22 with its transistor testing facility but limited a.c. measurement ranges.

On Test

I checked the accuracy of the d.c. ranges first. I didn't expect any problems, and indeed found that the quoted tolerance of ±0·5% + 1 digit was well fulfilled. Some overload tests were next carried out. Hardly daring to look, I set the knob to the 20kΩ resistance range and plugged the probes into the mains. No sweat: the display flickered about a bit but there were no other signs of distress . . . On to the 2V d.c. range then and hook up to a 950V TV set boost line. Up came the display "1.", indicating an overload – and how! Such liberties would blow apart (or ignite?) many an analogue meter.

For general service work I found the meter easy to use and easy to read. The measurements on all ranges stabilise within a fraction of a second and remain steady thereafter. Though recessed, the display is readable over a very wide arc: even so a prop or tilt-stand would have been appreciated to set the instrument at an angle of 30° or so for use on the bench. To check the meter's performance when a rapidly changing voltage is being checked I found an old TV set with a half-wave rectified h.t. supply. The voltage across its reservoir capacitor varies in sawtooth fashion between 205V and 220V, at 50Hz. Connected to this point the DVM gave a surprisingly steady reading of 214V, occasionally flicking to 213V or 215V. This is very good, in marked contrast to the fruit-machine effect I've noticed in the past with other digital meters. For any more "peaky" waveforms than this an oscilloscope is really more appropriate than a DVM. The meter is average reading/r.m.s. calibrated, as is usual with this type of instrument: the instuction book gives a correction table for seven standard waveform shapes to

Table 1: Abridged Specification.

Ranges:
D.C. voltage: 0·2, 2, 20, 200, 1,000V.
A.C. voltage: 0·2, 2, 20, 200, 750V.
D.C. 200µA, 2mA, 20mA, 200mA, 2A, 10A.
A.C. 2mA, 200mA, 10A.
Resistance: 200Ω, 2k, 20k, 200k, 2M, 20M.
Diode test: Forward voltage of junction indicated.
Continuity: Audible buzz when resistance is <30Ω.

Accuracy:
D.C. voltage: ±0·5% of reading + 1 digit basic.
A.C. voltage: ±1% of reading + 2 digits basic (40-600Hz).
D.C. ±0·5% of reading + 1 digit basic.
A.C. ±1·5% of reading + 1 digit basic (40-600Hz).
Resistance: ±0·5% of reading + 1 digit basic.

Overload capacity:
200mV range: 700V d.c., 500V a.c. r.m.s.
Other voltage ranges: 1kV d.c., 750V a.c. r.m.s.
Current ranges: 2A/250V fuse; 12A a.c./d.c. on 10A range.
Resistance ranges: 400V d.c., 300V a.c. r.m.s.
Diode test and continuity ranges: 300V d.c., 250V a.c. r.m.s.

Input resistance: 10MΩ on voltage ranges.

Voltage drop: 10A range 350mV at full scale; other ranges 250mV at full scale.

Diode test: 3·2V max.; 200µA max.

Battery: 9V type, PP3. Life approximately 800 hours.

Dimensions: 170 × 91 × 40mm (6¾ × 3⅝ × 1⅝ in.).

Weight: 330g (¾lb) approximately.

cater for the inaccuracies that arise when the measured waveform departs from the sinusoidal shape.

The applied voltage on the resistance ranges is 0·25V or 0·4V, neither of which is sufficient to forward bias a silicon junction. In-circuit testing is thus facilitated – so long as no large capacitors are present to confuse the issue. This worked well, as did the buzzer (bleeper actually) continuity test, with which full attention can be given to the circuit board or whatever under test. The bleep occurs when the resistance present is less than 30Ω: as an aid to true continuity testing (i.e. print tracks and plug-socket connections) I found that a 22Ω resistor in series with one prod went a long way towards avoiding "false clears" via parallel paths.

Regarding the physical aspects of the meter, I found the single selector switch positive in its action and the brightly coloured range segments and their labelling clear and unambiguous. The test prods supplied have 2mm × 10mm pointed metal spikes: for use with today's TV and VCR equipment these cudgel-like ends need to be replaced with something more appropriate from the RS Components range. This implies no criticism of the makers, since they can't be expected to fit tiny prodclips to a meter with a 10A range which may be used in a car repair bay, a telephone exchange or a physics laboratory . . .

Conclusion

My view is that this is an excellent example of a DMM. It's probably more expensive than superficially similar types from other sources, but if reasonably treated this one looks set to have a very long life, throughout which the most creditable back-up and recalibration service is available from Thorn EMI Instruments at Dover – service agents cover the warranty and after sales service overseas. The UK net trade price (from April 1st) is £50·90 plus VAT. It's available from distributors and wholesalers, including HRS of Birmingham (021 771 2525).

Letters

BEWARE OF "SURVEYS"

A survey carried out by trading standards officers of the Birmingham consumer services department seems to seek to prove that we're all crooks and con men in the TV and video repair trade. As a regular reader of *Television*, and having been employed as a TV engineer and service manager for more years than I care to admit, I was both startled and amazed when I was contacted by the editor of our local newspaper. Apparently our small but well established company of over fifty years standing had become a victim of the consumer services department's video repair survey (titled video repair racket). I'd be pleased to hear of others' views of the "survey" as it affected us.

A Ferguson 3V29 VCR, doctored with a blown fuse, was brought into our service department by a trading standards officer. He simply asked for the machine to be repaired, leaving no explicit instructions. One of our engineers began to work on the machine and quickly found a blown 1·25A fuse in the 12V l.t. line supplying the tuner/i.f. strip/modulator section of the VCR. Now we all know that this particular fuse, having a good rating and little work to do, doesn't blow just because it feels like it or there's an R in the month. We've all been warned by the manufacturers, and by those who write in *Television*, about the nasties that are often found in VCRs – the toys, hairpins and other bits and pieces that are posted via the cassette flap by bored small children, and of course the odd glass of orangeade that can in some cases set fire to the machine or write it off completely. In view of this we made an extensive search of all panels and boards, also removing the bottom cover to check for signs of recent liquid spillage. As no obvious cause could be found for the blown fuse we ran the machine for a good many hours in all modes. It was finally left in the E-E only mode.

During this test one of our engineers noticed a drop in the gain on all channels, pointing to a problem in the r.f. tuner. Unfortunately no obvious dry-joints or bad connections could be seen and no amount of probing cleared the low-gain condition, so we decided to fit a service replacement tuner. This cured the low-gain fault. We then retested the machine and were rewarded with excellent pictures, both via prerecorded tapes and of course its own.

We would normally ring the customer to explain the situation and give a quotation for carrying out the repair. Unfortunately the trading officer (who called himself Mr. Neville) had left a false name and address and had declined to leave a telephone number. When he called to collect the machine he paid the bill and made no complaint about it. Since he didn't tell us he was from the consumer services department we were given no right of reply or opportunity to explain the situation or demonstrate the effect of the faulty tuner. We didn't hear about the so-called survey until some three months later. According to their magazine we'd been accused of doing unnecessary work. Only the fuse should have been replaced, nothing else should have been done.

By pure chance a copy of the press release posted to our local newspaper came into our hands. It seems that the survey had been conducted by experts. We made many phone calls asking to speak to them. Eventually, as a result of our persistence, we gained the information that they had only one expert and that he didn't actually work for the consumer services department. They were not prepared to divulge his name. Many more phone calls were made, all in vain. The door was firmly slammed in our faces. They even denied receiving letters (registered) from us. In desperation we contacted our local councillor, asking for a meeting with the trading officer and expert. A meeting was eventually held, attended by the chief trading officer of the consumer services department, the councillor and myself. The expert was not present. I asked the trading officer whether we could speak to their expert. The firm reply was no we couldn't. The councillor asked why not, and the rather nonchalant reply was that he didn't want to get involved in any disputes. In his absence the trading officer agreed that a fuse was a safety component, but in his view the only action that was necessary was to replace it. No other tests or work were needed.

I'd be interested to hear what other readers think of this. Have we been wrong all these years in looking for the cause when we find a blown fuse? Maybe we should short them all out if they are fitted to blow for no good reason. Do you think this was a fair test?

G. Roberts, Service Manager,
Solihull, W. Midlands.

Editorial comment: This sounds to us like a rather dirty trick. Or maybe just ignorance. Any fool can doctor a

machine by fitting a dud fuse. This doesn't seem to be a very clever way of assessing the standards of workmanship and service provided by a firm. It's a fact that reputations are hard to build – through conscientious work over the years. They are easily lost – by a simple mistake, an innuendo, or whatever. It seems to us that the machine was dealt with in a wholly responsible manner. Carrying out a repair without consultation could perhaps be criticized, which is easily done with hindsight: once you're involved in testing a machine it's fair to do whatever is required to get it to perform to a reasonable standard. It appears that the Birmingham consumer services department operated with fewer than the scruples one would expect of them.

COMPUTER USE

I read with interest the article (February) on using a microcomputer as a database for storing information of help in servicing, having created a large database for my own personal use. This contains a reference to every query that has been published in Service Bureau since January 1979. As it wouldn't have been practical to enter the whole text, both question and answer, I simply have a field which contains the question, paraphrased. Other fields contain the model, make, module (i.e. area of the set in which the problem occurred) and of course the page, month and year of issue of *Television* containing the query. For reference I keep an up-to-date print-out of all the queries, sorted by model, make and module alphabetically, with a contents list, though it's possible to sort by any of the fields or even to search for records containing key words.

When encountering a strange set or problem not seen before it's useful to be able to check answered queries relating to similar faults. This has saved much time chasing otherwise obscure faults. It relies on keeping back issues of the magazine, but as I do this anyway it doesn't represent an overhead.

On a cautionary note I'd like to point out to readers considering the use of a database for records of rental sets etc. containing names and addresses of customers that they may be subject to the data protection act. A database containing "personal data", i.e. data that relates to a living individual who can be identified from the information stored (or from that and other information in the possession of the data user), must be registered with the Data Protection Registrar's Office unless exempt from the act for whatever reason. I would advise anyone keeping such a database to familiarise themselves with this act as soon as possible, even if they suspect that they may be exempt from it.

S. Haynes,
Woodbridge, Suffolk.

THE ITT FT110

I was interested to see George Wilding's article on the ITT FT110 chassis in the February issue, having had a couple of these sets in recently. One thing that puzzled me was that while the circuit diagram shows BU208s in the chopper and line output positions the handbook shows the line output transistor as being a BU500. Only one of my sets – the one with most of the faults – was fitted with a BU500. The other set had blown its BU208 line output transistor. Replacing this with a BU500 gave faultless performance – the set hasn't come back since I sold it some months ago. The first set had to have a new line output transformer and then consumed several BU208s that were robbed from scrap G8 panels. It settled down after fitting a BU500. One problem I had was severe teletext interference over the top half of the raster. C431 (47μF) in the field flyback clamp driver transistor's base circuit was found to be responsible for this – it had gone open-circuit.

There don't seem to be many of these sets about, but they do give a good picture when properly set up.

L.E. Seeney,
Scarborough, Yorks.

THE PANASONIC TC2205

One of the problems I've had over the last twelve months has been sound variation with the Panasonic TC2205. Replacing components in the sound and remote volume control circuitry failed to reveal the cause and quite by accident I found that removing C1059 (4·7μF) on the remote control decoder board cleared the fault. Fitting a new component in this position restored the set to the fault condition. I've since removed C1059 in some twenty sets to cure the fault and have had no "call backs". Can anyone explain why lifting this component should correct the fault?

John L. Howard,
Barnstaple, N. Devon.

PHILIPS G11 QUERY

P. Odenrode asks about R1308 in the Philips G11 chassis burning out (Letters, February). Our experience is that this happens when the mains fuse F1301 has blown violently due to one or both legs of the mains rectifier block D4005 going short-circuit. R1308 burns and goes open-circuit because it's of much lower impedance than the parallel filter choke L1305. This is my explanation anyway – there may be another.

Hugh MacMullen,
Newquay, Cornwall.

CUSTOMERS' DIAGNOSES

Having been in this trade for nearly thirty years I'd like to write a few words to get something off my chest – it's driving me to become a demented alcoholic you see! This is the daft complaints I get over and over again – "the picture valve's gone", "it's the on/off switch" or, if you get a recall, "it's the same again". Even with these new-fangled devices called VCRs you get the same thing – "the heads have gone" they cry. As Billy Connolly would say, "Who Are These People?". Do they really think that all there is to a set is a piece of glass and an on/off switch?

Is it just me or do others out there in TV-man land suffer from the same technical "diagnoses". I must know – I'm heading for a nervous breakdown!

Colin Goodman,
Corby, Northants.

CHIP WANTED

Does anyone know where I could obtain a TDA1004A chip? – it's a 10W amplifier. All the suppliers tell me that it's obsolete. Perhaps someone has one they could sell me?

John A. Hanley, 306 Thornaby Road,
Thornaby on Tees, Cleveland TS17 8PJ. 0642 606 731.

Teletopics

BOOMING TRADE

The latest figures released by the British Radio and Electronic Equipment Manufacturers' Association (BREMA), covering the period October 1985 to September 1986, show that trade in the TV/video section of the consumer electronic goods market has been booming. TV receiver deliveries to the trade during the period rose to 3·9 million, the highest ever total for a twelve-month period. Demand for small-screen colour sets remained particularly strong, with deliveries at 1·9 million and sales estimated to have been 1·8 million. This has been a feature of the trade for six years now: the previous highest total delivery for a twelve-month period was 1·6 million in 1984. Total TV receiver deliveries during the period rose by 11 per cent and comfortably exceeded the previous twelve-month record of 3·57 million sets in 1984. The advent of the FS tube is given as a factor in the increased sales of large-screen sets. The Royal Wedding and various major sporting events are also said to have helped sales, though the major reason given for increased sales is the general buoyancy of the consumer electrical goods market.

Unfortunately the proportion of imported sets rose, to 39 per cent (54 per cent in the case of small-screen sets), as home production failed to meet the rising demand. Some 1·5 million TV sets were imported and half a million were exported. The fall in the value of the pound is said to be helping to improve the UK's trade deficit in consumer electronic goods.

VCR deliveries during the period rose by 33 per cent to 2·2 million, almost reaching the record figure of 2·24 million in 1982. According to BREMA 49 per cent of UK households now own or rent a VCR. An increased number of lower-priced machines helped: in the third quarter of 1986 a third of VCR deliveries were of models selling for less than £350 while three quarters were in the under £400 price bracket. Camcorder sales are on the increase and are expected to reach 80,000 units – sales during the first three quarters of 1986 matched those for the whole of 1985. Sales of home computers continued to fall.

This year's Consumer Electronics and Technology Show, which was to have been held at Earl's Court next month to coincide with the annual brown goods shows at London hotels, has been cancelled. The organisers blame lack of support: most of the larger companies prefer to run their own shows instead of participating in a general exhibition.

FERGUSON'S NEW CTV CHASSIS

A new chassis to supersede the popular TX90 has been announced by Ferguson. Whilst the new TX85 chassis looks like the TX90 at an initial glance, and is also intended primarily for use in small-screen models, there have been a number of significant changes. The main difference is the use of a new chopper power supply with mains isolation: the shunt chopper transistor is controlled by a TEA2018A chip. The TDA4500 i.f./sync/timebase generator chip used in the TX90 has been replaced by a TDA4501H which incorporates a sandcastle pulse generator. A TDA3565 replaces the UPC1365C colour decoder chip and a TBA820M is used to provide the audio output. The RGB and field output stages remain as in the TX90. An interesting three-transistor line driver stage is used, eliminating the need for a driver transformer. The main panel is designated PC1200-001 in the non-remote version, PC1200-011 for receivers with remote control.

Ferguson has published a field service engineers' pocket book covering the TX9 and TX10 chassis. This consists mainly of a summary of modifications and fault guidance previously published in *Ferguson Feedback* but is nevertheless a useful item that can easily be slipped into the toolbox. It's available from the Ferguson service division at 75p a copy.

A chip for decoding digital stereo TV sound transmissions is being developed by Ferguson in conjunction with Texas Instruments. Production is expected to start at Bedford next January. Basic design has been undertaken by Ferguson who will be offering digital stereo sound decoder modules to other setmakers.

VIDEO ROUND-UP

The latest VCR from Toshiba, Model DV80, incorporates an interesting feature not previously available in the UK. A digital memory enables the user to freeze either the off-tape or off-air broadcast picture. Other features include a 16-channel voltage-synthesis tuner, a four-event 14-day timer and infra-red remote control. All for a suggested retail price of £460.

JVC's latest VCR, Model HRD470, is designed to fit into a midi audio system, being just 340mm wide. To achieve this the tape transport system has been rotated through 90° – you insert the cassette endways. There's HQ vision circuitry, hi-fi stereo sound and a new audio noise reduction system. Other features include simulcast recording (a TV programme and an f.m. radio broadcast can be recorded simultaneously, either as combined or separate tracks), a go-to facility operated via the remote control handset, and music scan. The latter system works by noting the breaks inserted between audio sections by the record mute function: to find the start of a chosen audio track the user specifies a number and can scan up to nine selections in either direction. There's a 32-channel synthesiser tuner and an eight-event one-year timer. The suggested retail price is £629.

Samsung's 4mm camcorder, first mentioned in this column last December after its showing at the S. Korean Radio Exhibition, is to go on sale in the USA this summer at $1,300. The cassette is the same as that used for the DAT (digital audio tape) system whose release is imminent. The Samsung camcorder incorporates a TV tuner and a 2·5in. liquid-crystal display for TV, playback or viewfinder use.

TRADE NEWS

Salora and Luxor have moved to a new joint UK headquarters at Bridgemead Close, Westmead, Swindon, Wilts SN5 7YG. The two companies will continue to trade separately.

A range of Zanussi manufactured TV receivers is to be released under the Seleco brand name. Both Zanussi and Seleco receivers will be distributed by Seleco (UK) Ltd., Orchard House, Amersham Road, Chesham, Bucks HP5 1NE.

CPC Electronic Component Distributors have been appointed sole UK distributors for the sale of Amstrad spares and components to the trade and the public. The official launch of the service to the public took place at CPC's Preston headquarters on January 28th, the service

to the trade having been established some months earlier. The address and telephone number are 194-200 North Road, Preston, Lancs PR1 1YP – 0772 555 034.

We have received several letters from readers in New Zealand asking where the Telelift, which was reviewed in our November issue, can be obtained in that part of the world. Those in Australia and New Zealand can obtain the device from Telelift, PO Box 289, Mortdale, NSW 2223, Australia.

KEEP 405 ALIVE

The British Amateur Television Club has, with a number of fellow enthusiasts, formed the "Keep 405 Alive" society whose purpose is to preserve in working order items of 405-line equipment. Annual subscription is £2 plus four stamped, addressed envelopes for a quarterly newsletter – the first one is due to be produced shortly and will, amongst other things, carry free advertisements for members wishing to buy, sell or exchange 405-line equipment. For further details send a s.a.e. to Bill Journeaux, 7 Blair Avenue, Poole, Dorset BH14 0DA (0202 748 072).

PUBLICATIONS AND CATALOGUES

The British Amateur Television club has published a new book entitled "The Slow Scan Companion", by C. Grant Dixon G8CGK, John Wood G3YQC and Mike Wooding G6IQM. It's a detailed work covering all aspects of slow-scan TV, including standards, reception and transmission, studio equipment and techniques, colour operation and commercial equipment. The book is well illustrated and runs to 100 pages. It can be obtained from BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN at £3·50 including postage. Well worth it to anyone interested in this aspect of TV.

The latest catalogue from Electrovalue contains more pages (sixty), more items and more illustrations than ever before. You don't even need to stamp your envelope when sending for a free copy. Simply address your request to Electrovalue Ltd., Freepost, 28 St. Jude's Road, Englefield Green, Egham, Surrey TW20 8BR or phone 078 433 603.

PROGRESS WITH CABLE TV

According to the latest figures released by the Joint Industry Committee for Audience Research (JICCAR) some 188,459 UK households were connected to a cable TV system on January 1st, an increase of 7·9 per cent during the last quarter of 1986. The number of house holds for whom a cable TV service is available rose to 1·18 million, an increase of 3·8 per cent. The JICCAR research found that subscribers increased their cable channel viewing time, as a proportion of total TV viewing, from 21 per cent to 28 per cent.

NEW PRODUCTS

Riscomp Ltd. (51 Poppy Road, Princes Risborough, Bucks HP17 9DP – 084 446 326) has introduced a new passive infra-red intruder detector, Model RP33. It works by sensing the body heat of an intruder within the protected area. The detector uses a Fresnel lens and provides volumetic coverage through an 85° angle, with 24 zones over a range of 12 metres. Its miniature size (80 × 60 × 40mm) enables it to be easily installed on any flat surface or corner location: vertical adjustment of the detection pattern over a 10° range is provided in order to achieve the most effective coverage. A further aid to installation is provided by the switchable walk test indicator, which provides a visual indication of its effective range. The unit is suitable for use in most security installations, requiring only 15mA from a 12V supply. It comes with full installation instructions for £23·95 plus VAT.

A new satellite TV receiver, Model RSR30P, has been introduced by Rediffusion Radio Systems Ltd., Satellite Systems Division, Unit 9, Mole Business Park, Randalls Road, Leatherhead, Surrey KT22 7BA (0372 379 620). The new model is an enhanced version of the receiver introduced last year, incorporating a number of additional features. It allows for full remote control of polarity and skew: these parameters are programmed into memory using the infra-red remote control handset and are automatically recalled on individual channel selection. A new polarotor, type RPR1, works in conjunction with the new receiver and has been designed for simple mounting.

FRENCH TV CHANGES

The new French communications regulatory body (the National Communications and Freedom Commission) has awarded the franchise to run the fifth French TV channel La Cinq to a consortium led by Robert Hersant, the right-wing newspaper owner who controls some 30 per cent of the daily press in Paris and the provinces, including the daily newspaper Le Figaro. The consortium includes the two former licence holders Silvio Berlusconi and Jerome Seydoux. The franchise to run the TV6 channel, which concentrates on music and video extracts, has been awarded to the Metropole TV consortium which is led by the Luxembourg CLT broadcasting group and a French water utility (Lyonnaise des Faux). Bids to run the TF1 network are still being considered – the government has put a £320 million price on the offer of a 50 per cent interest. The remaining shares in the network will be offered to the public.

DAT IMMINENT

Aiwa is poised to market the first digital audio tape recorder in Japan. The machine is expected to sell at about £850, with the cassettes selling for £12-£15. Aiwa (UK) Ltd. say there are no plans at present to market the machine in the UK. There has been considerable concern world wide on the effect DAT could have on the compact audio disc. To protect the copyright in original sound recordings Thorn EMI and others in the UK have been urging that legislation be introduced through the EEC requiring a copyright guard system to be fitted on DAT recorders. The worldwide music industry would in parallel incorporate an encoded key into compact discs and prerecorded DAT cassettes compatible with this guard system to prevent copies being made on DAT machines. A bill with this aim is at present before the US Senate.

IN BRIEF

Radio Telefis Eireann is to introduce a full teletext service this month using a standard that's fully compatible with BBC and IBA transmissions . . . An advanced vision system is to be developed by Thorn Research, LaserScan, the Royal Signals and Radar Establishment and University College London. The aim of the £2·5 million Alvey project is to develop a system that processes images from two cameras to give a three-dimensional display . . . A two-way mobile radiotelephone system is expected to be introduced during the next few months using the old Band III TV band.

Faults in CCTV Systems

Part 2

Peter Graves

This is the second of three instalments in a series that looks at some of the more unusual faults encountered in servicing CCTV systems.

Cabling Problem

A multiple camera system with over thirty cameras had been installed some years previously in a large shopping centre. During a spell of cold weather the pictures produced by almost all the cameras deteriorated suddenly (low level, distorted sync pulses, hum bars and noise). Maintenance had been taken over from the company that had carried out the installation, and no site drawings or circuit diagrams were available.

Most of the cameras and monitors had been checked during a routine maintenance visit shortly before the fault developed, so the problem had to be in the cabling. This extended over three storeys of the centre, on cable trays that were above a suspended ceiling for part of their length. Measurements showed that the cable earths were high-resistance. As a result the signal return path was via the mains earth, the mismatch causing the poor pictures.

We noticed that the sheaths of the coaxial cables leaving the control room were of a different colour from the cables at the cameras, indicating that there were junctions somewhere along the cable runs. It took some time to locate them, working along the cable trays from the control room. When we did we found that the coaxial cable ends had been terminated with domestic Belling-Lee plugs and joined with back-to-back barrel connectors. After a few years in the extremes of temperature found in the roof void – the heating was turned off at night – the cable screens had oxidised and the aluminium plugs had corroded slightly. This caused intermittent contact of the screens as the connectors expanded and contracted, particularly when they contracted in the cold.

The plugs were cut off and the cables were joined with crimps wrapped with insulating tape. This eliminated most of the problems, the few remaining indicating that there were other cable joints. The problem was in finding them!

Condensation

An external camera was enclosed in a heated, weatherproof housing overlooking a yard at the rear of a shop. The customer complained that the pictures were poor first thing in the morning.

An engineer called several times, usually mid-morning, and checked the camera and its housing. The camera was working satisfactorily: it was not intermittent, and the housing's heater was operational. We finally realised from the customer's comments that the problem was due to condensation on the housing faceplate.

The system had been installed by a subcontractor who had connected the mains wiring for the housing's heater and the camera in parallel, taking a single cable back to a plug inside the shop. When the shop closed in the evening the camera was switched off: it was switched back on in the morning. During the night the housing cooled and condensation formed on the inside of the housing's front glass, clearing slowly in the morning when the heater came on. Unfortunately it had cleared on each initial visit by the engineer.

The problem was easily cleared: the mains supplies for the camera and the heater were separated, a new mains cable run being installed so that the heater remained on all the time.

Lack of Termination

The automatic iris control unit used with an external camera fitted with a low-light tube would close the lens iris intermittently, reducing the video output level to zero. The only clue we had was that the fault occurred more often in cold weather. This was another fault that couldn't be induced while an engineer was on site: it took several trips to locate the cause.

The auto-iris unit monitors the camera's video output, driving a small motor connected to the lens iris in order to keep the light level applied to the tube, and hence the level of the output signal, constant despite changes in the external illumination level.

The auto-iris arrangement is shown in simplified form in Fig. 1. As you can see the camera's video output is routed through the auto-iris unit before passing to a monitor. Within the auto-iris unit an amplifier with a high input impedance to minimise signal loading monitors the signal. The amplifier's output is rectified and smoothed, the resulting d.c. signal being applied to one input of a differential amplifier. A voltage derived from a preset potentiometer is fed to the differential amplifier's other input. As a result, the differential amplifier produces an output that's proportional in amplitude and polarity to the difference between the d.c. levels at its two inputs. The amplifier's output drives the motor connected to the lens iris.

When conditions are steady, the d.c. voltage derived from the video signal will be the same as the voltage tapped from the potentiometer and the output provided by the differential amplifier, and hence the voltage applied to the motor, will be zero. Suppose that the scene illumination increases. The d.c. voltage derived from the video signal will increase but the voltage derived from the potentiometer will stay constant. Thus the voltage across the amplifier's input terminals will rise. The output voltage in turn rises and the motor starts to rotate. Because of the mechanical connection between the motor and the iris the latter will be driven towards the closed position. The illumination applied to the tube's face thus falls and the video output level drops. Eventually a state of equilibrium will be reached and the motor will stop with the iris in a new position. The opposite sequence occurs when the scene illumination decreases. The signal output level is set by the potentiometer, which establishes the equilibrium conditions.

The problem on site was caused by a constructional fault in the auto-iris unit. BNC bulkhead sockets were used for the video input and output signals, the sockets being fixed to the metal case by means of single nuts, with the case providing a common earth connection. During manufacture the case had been painted but the paint had not been cleaned away from the socket area. As a result

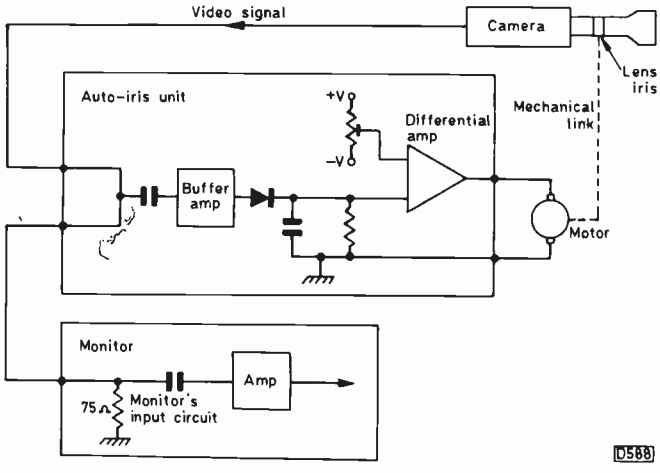

Fig. 1: The auto-iris arrangement.

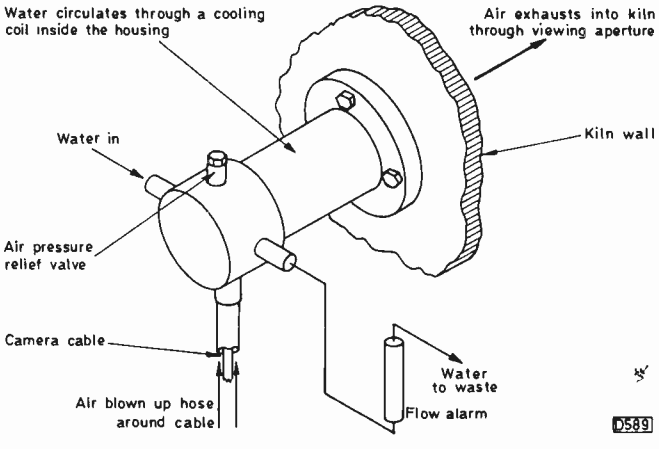

Fig. 2: Kiln camera equipment layout.

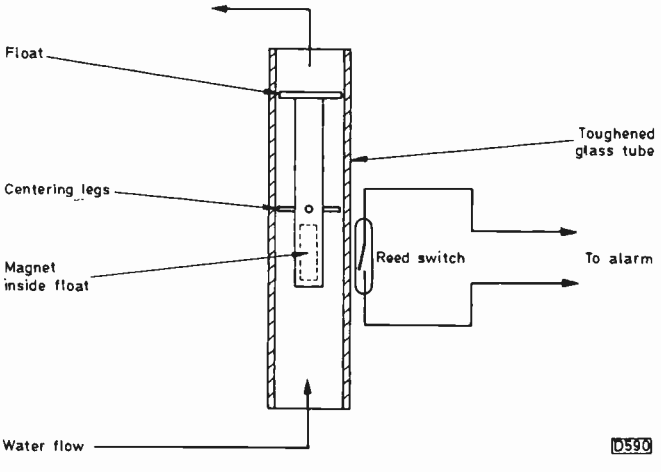

Fig. 3: Water flow alarm system.

the nuts (and their serrated washers) tightened down on to paint instead of metal. The washers must have just made contact with the metal when the unit was made, but after a few years of expansion and contraction following installation outdoors in an unheated cabinet the earth connection at one of the sockets would occasionally be broken, effectively disconnecting the cable terminating resistor at the monitor end of the cable.

Removal of the termination takes the load off the video output amplifier in the camera. As a result the output from the camera jumps up. To the auto-iris unit an increase in signal level due to an increase in illumination or an increase due to loss of the terminating resistance is the same thing. In either case the unit will shut the iris to compensate for the increased input. When the increase is due to loss of the terminating resistance, shutting the iris will not substantially decrease the signal level as the sync level will also be increased. So the iris will continue to shut until the lens end stops are reached, when the video output level will be zero.

The cure was to scrape away the paint. All the other units of this type on site were modified to prevent future trouble.

Cooling Problem

A camera used to view the interior of a cement kiln suddenly failed without warning. The camera was burnt out and the cable was damaged by overheating.

The camera was mounted in an air and water cooled housing (see Fig. 2). Air failure could be tolerated, as most of the cooling is done by the water. If the water supply stops, the heat from the kiln cooks the camera. The water flow from the cooling coil in the housing is monitored by a flow alarm (see Fig. 3). A float inside the glass tube contains a magnet. As long as the water flow is high enough the float will be pushed to the top of the tube, keeping the magnet at a distance from the external reed switch. If the water flow drops the float falls and the magnet operates the reed switch, triggering an alarm in the control room. When the alarm goes off the housing is supposed to be removed from the kiln manually to prevent damage.

The alarm had not gone off when the fault occurred, though it was known to be working. The first indication that anything was wrong had been the disappearance of the picture. By then it was too late: the camera had been irrepairably damaged. The cause of the problem was that during a spell of very cold weather the flow alarm had frozen solid, preventing it from working. It was necessary to replace the camera and the work that had to be carried out on the cable made it an expensive repair.

Finding Cable Shorts

The problem was neither picture nor syncs from a camera in a shop. Connection between the camera and the power supply was via a twin-axial cable that ran round the shop near floor level. Twin-axial is like ordinary coax but has two inner conductors, one taking the d.c. power supply to the camera and the other bringing the video back to the monitor. With twin-axial only one cable is required, but the choice of camera is restricted.

In this installation the d.c. supply for the camera came from a package regulator on a heatsink. When the engineer arrived he found that the regulator was running very hot. The twin-axial cable was disconnected at both ends and checked with an ohmmeter. This revealed that there was a short-circuit between the screen and the power supply core at some point along the cable. The ohmmeter could measure down to fractions of an ohm, and by measuring the resistance through the short-circuit from both ends the distance to the short along the cable could be estimated (see Fig. 4). A visual search in the area revealed nothing, but a more detailed investigation by running a finger along the cable revealed a staple that had been driven into the cable and cut off flush with the sheath. Pulling the staple out cured the fault.

Some tactful questioning revealed that it had not been a case of deliberate sabotage. An employee stapling in the

area had accidentally pushed one into the cable. Instead of telling someone or pulling it out he'd simply cut the staple off short, turning a minor problem into a major fault.

VCR Problem

A VCR in a garage installation wouldn't record. The cameras and VCR were used to record anyone running off from the pumps without paying. The VCR ran continuously, automatically rewinding when the end of the tape was reached. Except for the few minutes spent rewinding, there was a continuous record on the tape of the previous three hours of activity at the garage. In the event of an incident the machine was stopped and the tape removed.

To make operation as foolproof as possible the recorder had a plug in the remote control socket at the rear, wired so that the machine was permanently in the record mode. A switch on the plug selected normal operation for testing or playback.

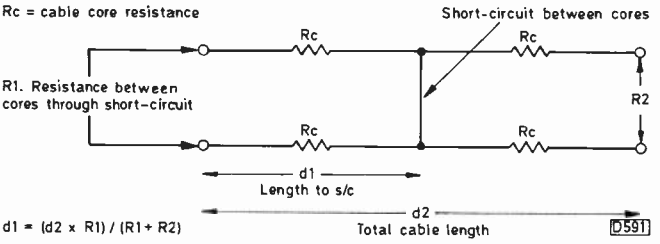

Fig. 4: Using cable resistance measurements to establish the approximate position of a short-circuit.

The engineer arrived on site to find that the machine wouldn't record in either switch position, or with the remote control socket plug removed. It seemed that the recorder was faulty. Fortunately a spare machine was available, and when this was connected in place the results were exactly the same. A disgruntled employee had removed the safety tabs from all the cassettes on site just before he left.

Dealing with Mains-borne Interference

J. LeJeune

As the amount and complexity of sensitive electronic equipment connected to the mains supply increases daily, and the number of major domestic electrical appliances in use continues to mount, so the problem of mains-borne interference grows in size. Computer users will be all too familiar with lock-ups caused by transients on the supply getting into the operating system and causing the execution of a program to crash, and users of sensitive electronic equipment, whether for business or pleasure, will be familiar with the annoying effects of mains-borne garbage.

Fortunately the way in which each dwelling or business is connected to the mains supply that runs along the street minimises the risk of a lot of "hash" escaping from one user to affect others. The current-coil in the electricity meter acts as a buffer, providing sufficient series impedance to attenuate short-term, high-frequency transients. Fig. 1 shows the electricity supply path between adjacent consumers. From this it will be appreciated that disturbances generated by one user are partially attenuated en route to next door or down the street. Interference and transients generated within a household or other establishment are thus largely confined to it, and because of this are easy to combat.

Domestic Appliances

Large domestic appliances are the main source of random transients that arise from thermostatically controlled loads such as refrigerator compressor motors, central heating pumps and electric heaters. These can be effectively tamed by connecting a mains-voltage VDR across the live and neutral terminals in the plug-top. The resistance of the VDR falls as the fourth power of the increase in applied voltage above a certain level. They can be purchased from most good component suppliers, who will advise on the correct type to use. Washing machines and dishwashers rarely give trouble unless they have been got at by an inexperienced person, since they incorporate an effective built-in mains filter. This resembles a large aluminium electrolytic capacitor with four or five terminals at one end and a threaded shaft at the other for mounting purposes. Whenever I discover a washing machine that's about to be scrapped I rescue the mains filter from it, for they are exceedingly useful!

Basic Mains Filter Circuit

Having arrived at the subject of mains filters we should point out that the majority of these rely on the provision of an effective earth. For a filter to cope adequately with all kinds of mains-borne hash it must be able to remove both line-to-neutral and line-and-neutral-to-earth interference, shunting all varieties of unwanted garbage away to earth.

If you don't have access to old washing machines and find ready-made types a bit expensive you can always make your own. The circuit of an all-mode mains filter is shown in Fig. 2. The choke is easily made or can be purchased, or a scrap filter choke from an old second-generation colour TV set with a thyristor regulated power supply can be used. The Thorn 8000/8500 series chassis is a good example: its GEC, Philips and Rank contemporaries are other sources. The chokes are generally bifilar types to eliminate polarisation due to the d.c. content of the receiver's current demand. The capacitors are 0·1μF, 250V a.c./1kV d.c. types. Wherever possible,

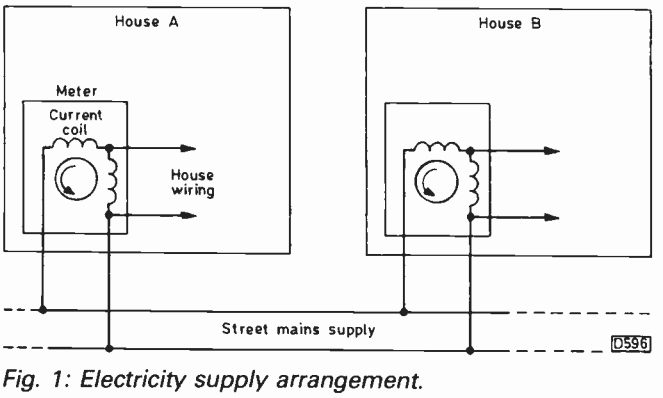

Fig. 1: Electricity supply arrangement.

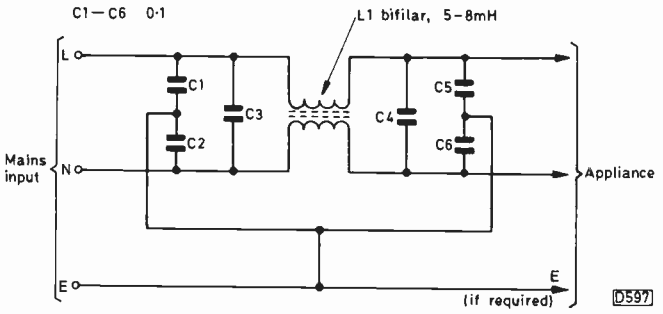

Fig. 2: All-mode mains filter.

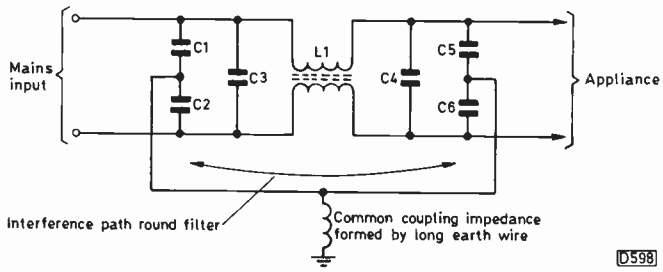

Fig. 3: Effect of using a long earth wire.

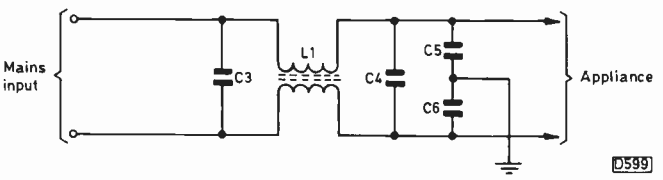

Fig. 4: Removal of C1 and C2 to improve performance.

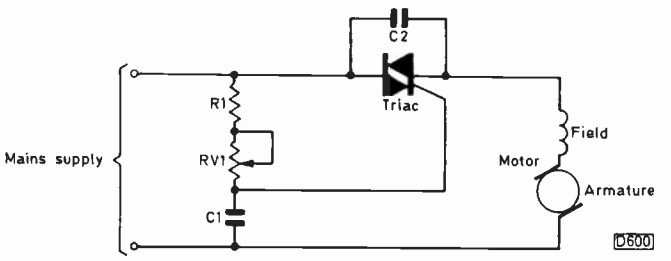

Fig. 5: A.C. motor controlled by a triac.

build the filter unit into one of those discarded plug-in power supplies that are so popular for small computers, TV games and portable radio receivers. Choose one with a metal earth pin so that the shunt capacitors make a direct connection to the house-wiring earth. Failing the availability of one of these boxes, use an ordinary constructor's project plastic box: fit a very short mains lead to it on the input side – use stout, three-core cable and a good-quality mains plug. Fig. 3 shows why a short earth connection is necessary: it can be seen that a long earth lead represents a common coupling impedance which can effectively destroy the filtering action. If a solid earth connection is not available it might in practice be better to remove C1 and C2 from the filter circuit – see Fig. 4. This will give good attenuation of unwanted interference coming from the mains but less attenuation in the reverse direction.

Induced Transients

A high-impedance circuit that's situated close to a mains-carrying cable is very vulnerable to mains-borne transients. This situation often arises in TV sets that have remote control. A filter will stop any trouble, but a cheaper solution would be to try to remove the mains lead from any sensitive areas. Screened mains cable is available and is effective in this instance but would cost almost as much to buy and fit as a filter. Screening sensitive portions of the receiver will also work but may in practice be difficult to put into effect, particularly where all the work has to be done on site.

Sources of Transients

Items that use small mains transformers and induction motors are notorious for generating hefty transients. These can crash a computer, upset a TV receiver's remote control system, produce plops from hi-fi loudspeakers and advance digital clocks by random amounts. Intermittent connections in the mains plugs connected to small appliances like clock radios, hairdryers and portable fan heaters generate randomly timed pulses that can be very difficult to track down. Since VDRs are inexpensive it's good policy to fit them in the mains plugs of any domestic appliances that are likely to cause interference via the mains supply. Such devices are far less effective when fitted at the mains input of the affected equipment, being most effective when fitted at source.

Thyristor and Triac Problems

Power control by means of the silicon controlled rectifier type of semiconductor device is very common nowadays. A characteristic of these devices is their very fast switching times. This is desirable in reducing power waste and lowering operating temperatures, but the fast switching generates r.f. interference that's radiated from the mains cabling to other equipment.

The first application of thyristors in consumer electronics products was in colour receiver power supplies, where they were used to provide both rectification and regulation. Receivers that use these devices generally incorporate mains filtering to prevent both radiation and conduction of interference. There may be instances of early models that are not fitted with such filtering, or where the filtering has been removed and bypassed during fault finding. The offending receiver is generally not itself affected by the interference it generates. The nature of the interference produced depends on the type of power supply used – either thyristor half-wave, dual-thyristor full-wave or bridge rectifier full-wave. To put it simply, half-wave designs generate transients at 50Hz while full-wave circuits generate transients at 100Hz.

Interference to television receivers is usually the result of conduction along the mains wiring and appears on the screen as a thin horizontal bar that moves slowly up or down, or is occasionally stationary. A pair of bars will be present when the interference is at 100Hz. The interference will also be radiated from the mains wiring, affecting long-, medium- and short-wave radio reception. For universal benefit suppression is best at source.

The use of triacs has spread widely. They can provide power control for room lighting, stage and theatre lighting, heaters, motors and for relayless switching in hazardous environments. Fig. 5 shows a simple circuit where a triac is used to provide speed control of an a.c. motor. The triac is a bi-directional device, conducting on both the positive- and negative-going excursions of the mains supply at a point determined by the phase-shift network R1/RV1/C1. As a result of this, horrible things are done to the current waveform. High-order harmonics that cause

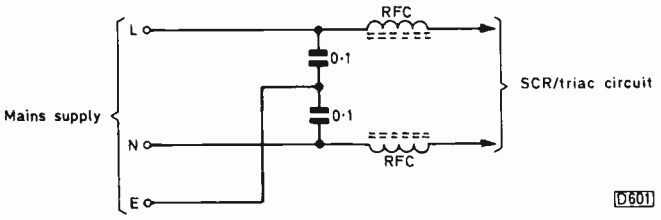

Fig. 6: Filter for use with a thyristor or triac circuit.

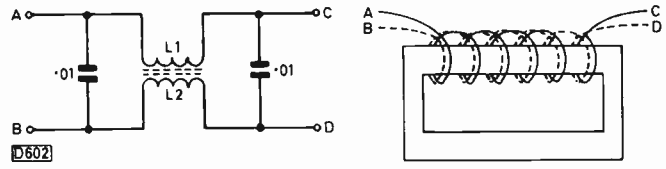

Fig. 7: Filter for use with a switch-mode power supply. L1 and L2 consist of 40 turns each of 24g enamelled wire bifilar wound on a line output transformer limb, with mains quality insulation.

r.f. interference are generated: the mains-borne transients are severe when an inductive load is switched. Since the triac operates on both excursions of the mains waveform the switching transients generated are at 100Hz. C2 is included to protect the triac when it switches off, providing a bypass to prevent damage from the high back-e.m.f. produced by the inductive load.

Because the current lags the voltage in an inductive circuit, considerable current will still be flowing when the triac's terminal voltage crosses zero and it switches off. Interruption of the current flowing in an inductance produces a high back-e.m.f. This occurs because the magnetic flux in the core collapses rapidly, the high rate-of-change inducing a high voltage in the coupled windings. The oscillatory voltage produced by the circuit shown in Fig. 5 is tuned by C2 in series resonance with the motor windings, the result being fed into the mains. The cure is not to remove C2 – that would simply destroy the triac.

Preventive measures against this sort of interference and transient generation should consist at least of series chokes in each leg of the mains feed, mounted as close to the device as possible. Shunt capacitors should be included to remove the l.f. transients. Fig. 6 shows a suitable circuit, with 0·1μF capacitors (250V a.c./1kV d.c.) and 0·5mH chokes. The filter circuit shown in Fig. 4 is effective. Series chokes alone will, generally speaking, work only with non-inductive loads like incandescent lamps and low-voltage heaters.

Even audio circuits can be affected by heavy circulating currents such as those encountered with theatre lighting. Buzz at 100Hz was a problem with stage microphone circuits until earth loops and common cable ducts were eliminated. The problem arises from the high harmonic content of the switching transients – very little of the fundamental is present.

Line-frequency Interference

Regulations governing the amount of line-frequency interference that can escape from a TV receiver via the mains supply were not mandatory until 1983. In consequence, long- and medium-wave reception in the vicinity of a working TV set can be spoilt. Since 1983 setmakers have fitted proper filters to prevent the feedback of line-frequency signals into the supply, and as a result the amount of annoyance from this source has

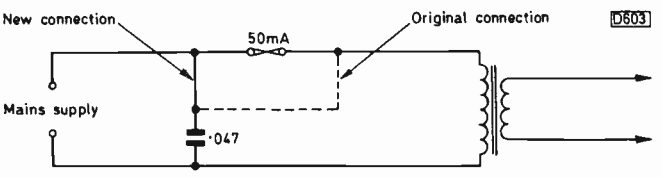

Fig. 8: Repositioning an anti-glitch capacitor.

fallen. Car radio users in particular can notice an increase in heterodyne whistles when passing beneath overhead mains cables.

Failure of the insulation in the bifilar choke used in some TV receivers has tempted many repairers to replace it with links. The receiver will operate happily without the choke, but could cause annoyance to neighbours listening to LW and MW broadcasts.

Switch-mode Power Supplies

The widespread use of switch-mode power supplies in TV receivers, hi-fi equipment and computers also necessitates filtering to prevent spurious signals being fed back into the mains supply. Most manufacturers fit suitable filters: where these are absent, external filtering is advisable. For this application a somewhat smaller filter can be used. To work properly the filter should be as close as possible to the power unit, ideally inside the cabinet. Problems with BEAB certification could arise however, so the best solution is to mount the filter very close to the equipment's mains lead entry point and to coil up the surplus mains lead. A stout cable should be fitted between the filter and the wall socket. Fig. 7 shows a suitable filter circuit. A fair degree of latitude is allowable with the component values: most important are the working voltages and the standards of insulation.

Earthing

The need to question the integrity of the earth wiring in domestic and industrial installations occasionally arises. Any good electrician has test gear which will give a speedy answer, and the means to rectify the defective section. Earthing is most important, as this is the place where a lot of the rubbish present on the mains supply is invariably dumped – after all it has to go somewhere. It's possible that the mains earth is inadequate, even at its best. In this instance a short, direct and stout connection to the nearest cold-water pipe should be considered.

Audio Tones

Area Electricity Boards superimpose a.f. control tones on the mains network at various times during the night and these can reach the domestic user. Low-consumption appliances like clock radios and digital clocks are fitted with a fuse in the mains transformer's primary circuit, 50mA being a common value. In addition to the fuse, a mains glitch reducing capacitor of between 0·047μF and 0·1μF is connected across the transformer's primary winding (see Fig. 8). The current taken by this capacitor at 50Hz is very small, but at higher audio frequencies its reactance falls and the current rises. In many cases the additional current taken by the capacitor when control signals are present on the supply is enough to blow the 50mA fuse. A simple solution is to move the "live" side of the capacitor from the transformer's primary winding connection to the input side of the fuse as shown in Fig. 8.

Servicing Mechanical VCRs

Part 2

Mike Phelan

Before we start this month, an addition to the list of tools required given in Part 1. A set of small, metric Allen keys, or at least one each of 1·5, 2 and 2·5mm, is essential.

Head Drum and Motor Assembly

The video head drum is driven by a motor via a belt – the ratio of the pulley sizes gives a speed reduction of approximately 2:1. Both the motor and the drum spindle are mounted at the correct angle for the VHS system. The motor (see Fig. 1) is screwed to a bracket that's attached to the chassis. Suppression is provided by ferrite beads threaded on the leads and feedthrough capacitors that are mounted on a bracket attached to the motor. There's also a 1μF electrolytic, and a ferroplastic disc is stuck on the motor's endplate. These measures prevent interference being picked up by the very sensitive head amplifier. The head belt is flat, and both pulleys have a raised section narrower than the belt width. This is termed "crowning", and prevents the belt coming off as follows. The belt, being under slight tension, adopts a form in which the edges follow a shorter path, i.e. the cross-section is a curve where the belt passes over the pulley. Centrifugal force tries to maintain this situation – if the belt tries to wander, one edge must travel inwards against this force. So the belt stays on.

The drum is mounted on an alloy plate that's pressed on the spindle. The upper part of the rotary transformer is cemented to this plate (see Fig. 2). The spindle rotates in two ballraces in the lower drum assembly. This is screwed to a substantial casting that carries the locating blocks for the guide rollers. The casting is in turn screwed to the deck plate and is positively located by dowels. A copper collar is mounted on the spindle beneath the lower drum. This forms the moving contact for the static earthing brush, which is carried on a small bracket with the servo pickup head. Two small magnets in the rim of the flywheel pass over the latter.

The lower drum also carries a heater, whose purpose is to remove any condensation on the head. It's actually a small, wirewound resistor that's held in contact with the lower drum, at the rear. There's even a thermostat. This is, ingeniously, a reed switch inside an annular magnet. It works on the same principle as a temperature-controlled soldering iron: at a certain temperature the magnet becomes ineffective and the switch opens.

Changing the Head Drum

Probably the most common operation required in this part of the machine is to fit a new head drum. The symptoms of worn heads have been well enough described in these pages, so we won't repeat them here. Be careful not to damage the old drum (in case it was o.k.!) or the new one. Unsolder the four leads, remove the two screws and lift the drum off. Handle the drums with a chamois leather or tissue to avoid marking the polished surface. If the drum can't be pulled off with a reasonable amount of force, apply a hairdryer for a short while. Don't lever the drum off.

Before fitting the replacement drum examine the flange on which the drum fits. A trapped hair or compressed spot of solder here can cause severe tracking errors which are difficult to trace, so clean the flange. Note that all the screws used around the head assembly are brass ones. Most replacement drums are of the relay pin type where the leads are connected to two plastic pegs. When soldering to these be careful not to overheat them, or to apply any pressure, as they are easily damaged. It goes without saying that the leads should be correctly connected – if one pair of connections is reversed there will be no chroma on recordings made by another machine.

Motor Replacement

The next most common servicing operation in this area is motor replacement. This is an easy job. Remove the belt and unsolder the leads first. Remove the three screws on the bracket and out will come the motor assembly. Note which way round the motor is mounted, and where the band is mounted. Unsolder the leads from the band, then remove the pulley by slackening the Allen screw. If this is reluctant to move, apply a soldering iron to it for half a minute or so. When this is off the three screws that hold the motor can be taken out.

Fit the band to the new motor and reassemble in the reverse order. The pulley should be flush with the end of the motor spindle. It will probably be necessary to transfer the ferrite beads to the new motor. A spot of Evostick will attach them to the leads. Both sets of leads must be connected the right way round or the 1μF capacitor will

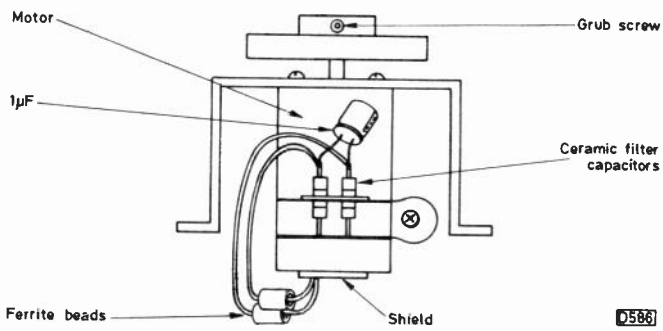

Fig. 1: The drum motor.

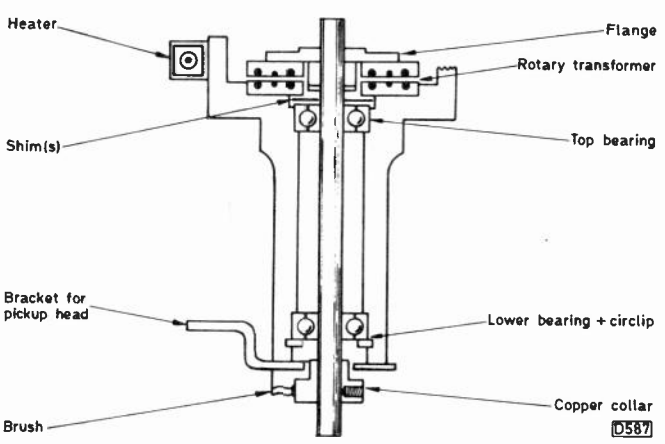

Fig. 2: The lower drum assembly.

go pop or the drum will run in the reverse direction – great for chewing tapes!

After replacing the motor it will be necessary to set up the drum servo. Ideally, the preamplifiers and switching points should be checked after drum replacement. The drum screen seems to enjoy the fate of the line output transformer cans of yesteryear – being screwed up and added to a collection of similar objects under the seat of the engineer's car. Try to find one if it's missing – it does make a difference to the amount of noise picked up.

The Lower Drum Assembly

After many hours of use the lower drum assembly bearings become noisy. Attempting to lubricate them is a sheer waste of time. The races are sealed and as they are not available separately the lower drum assembly must be renewed. It's best not to dismantle the assembly anyway as there are some shims between the drum mounting flange and the upper bearing to set the drum height. Also, it's necessary to remove the assembly to gain access to the loading arms below. This is not a difficult job.

To remove the lower drum for replacement, unsolder the thin leads from the circuit board behind the drum then remove the upper drum. Take off the drum belt and flywheel and the bracket carrying the static brush and pickup head. Tie this to a convenient point or unsolder it. Three screws hold the drum base to the deck. After removing them the entire assembly will lift off, limited by the leads to the preamplifier and the heater. If much work is to be carried out, unplug the preamplifier board and unsolder the heater leads, then remove the entire issue. To replace the lower drum only, invert the assembly, take out the screws securing the heater, then the three screws that hold the lower drum on to the base. Reassemble in the reverse order, remembering that this is a piece of precison engineering. The mating faces of the lower drum and base, the base and deck, must be clean. Otherwise the alignment will be impaired. If no new parts have been fitted, clean the copper collar and the top face of the lower drum. After reassembly, clean all the tape path surfaces. Isopropyl alcohol or even methylated spirit will do for the cleaning operations on the tape path components. Trichloroethylene and its derivatives are less suitable and some can have an embrittling effect on tempered steel parts after immersion for any length of time. The static earthing collar and brush must not be lubricated. Reassembly of the lower drum assembly is straightforward, in the reverse order to dismantling. The flywheel should go on to the spindle as far as it will, and the grubscrew must be very tight. Needless to say the latter must go into the locating flat, although I've seen attempts to fit it in a different place, resulting in something less than a whole picture!

TV Fault Finding

Reports from Chris Avis, D. Parsons, David McAuley, Hugh MacMullen and Richard Roscoe

Toshiba C2295

There was no colour and a 10kΩ resistor connected from pin 21 of the TA7193 chroma chip IC501 to chassis to override the colour killer produced unlocked bands of colour. Adjustment of the subcarrier oscillator "free-run" preset R552 just made matters worse. All the line pulses were present and correct, as were the voltages around IC501, but for some reason the oscillator frequency was way out. The culprit was C513 in the oscillator phase control circuit: it claimed to be a full 22nF but when cross-examined confessed to a mere 2nF of capacitance. **C.A.**

GEC PIL 20AX Chassis

This set lives in a very cold vicarage and produced a rolling picture of reduced amplitude when switched on from cold. The fault would always clear after a few minutes, and refused to show up in our relatively warm workshop. We decided to leave the set in the cellar overnight. This enabled us to instigate the fault, but it appeared too briefly for any useful checks to be made. After confining the set to the cellar for a few more nights we eventually traced the fault to the 10nF field sync pulse integrating capacitor C351 which had a peculiar fault: a resistance check showed no leak at room temperature or when frozen, but a 2-3MΩ leak was present as it warmed up after freezing, only to revert to normal thereafter. **C.A.**

Rediffusion Mk. III Chassis

Granada's reluctance to service these sets is now bringing more of them into our workshop. This one was tripping, apparently because the h.t. was high at nearly 280V. It couldn't be adjusted to the correct 270V. After fruitless checks in the regulator circuit we finally adopted a more sensible approach (why does it take so long?) and powered the set from a variac. With about 200V from the variac applied to the set the tripping stopped and a clue to the real fault was revealed – no EW correction. The EW transformer's windings had shorted across, causing the h.t. regulator to work harder to supply the extra current. Hence the misleading h.t. voltage and apparent loss of regulator control. **C.A.**

B and O 3600

Danish blue pictures on this set but nothing to worry Mrs. Whitehouse, just an open-circuit 1·5MΩ resistor (16R1) in the blue first anode preset's chassis return path. After a little grey-scale tweaking the usual B and O good quality picture was obtained, so the set was boxed up, left running on test and forgotten – until three hours later, when loud bangs (of the English variety) and tripping, followed by a deathly silence, reminded us of its presence. The 9·1nF flyback tuning capacitor 0C1 had fallen in value to 3nF, and the ensuing high e.h.t. had electrocated the BU208 line output transistor. Replacements restored the correct e.h.t., but with no EW raster correction. Replacing the BY299 diode 6D5 in the EW modulator circuit ended the saga – it had gone short-circuit. **C.A.**

Thorn TX10 Chassis

This 26in. set would usually come on normally but go off after a few seconds, then on and off erratically – or sometimes it would refuse to start at all. The symptoms didn't seem to indicate tripping so we checked the voltages around the chopper control chip IC801. This

revealed that the 12V supply from the regulator transistor TR801 was erratic. The BC547 transistor in this position had a dubious base-emitter junction and the associated zener diode D802 had a 200Ω leak. Replacing these items restored uninterrupted working. Unfortunately the set was back again two weeks later with "the same fault". I knew I should have replaced that old focus unit . . . **C.A.**

Ferguson TX100 Chassis

A strange fault has occurred recently on one of these sets (Model 22D2). Customers have complained that when dusting the face of the tube they notice a slight discharge through the cleaning cloth. When the set is later switched on it won't work because the 2·5A mains fuse has blown. Replace the fuse and the set works normally. The fault can occur even when the set is switched off but is left on at the wall socket. We've investigated the cause of this fault and have found that while dusting a slight arc discharge jumps from one end of C145 (which is in the degaussing circuit) to pin 2 of plug PL2 (unswitched mains), then a heavier arc jumps between pins 1 and 2, shorting out the 2·5A fuse. The remedy is to cut the print between C145 and pin 3 of PL2 and instead connect a piece of insulated wire between these points inboard of PL2. **D.McA.**

Sanyo 12-T280

This monochrome portable would intermittently go dead with battery operation but was o.k. when run from the mains supply. The first suspects were naturally the battery lead, plug and socket. Continuity checks showed that the connections through the plug and socket on to the PCB were indeed prone to bad contacts. We also found however that with a battery connected the set would sometimes remain dead even though power was getting through to the board. Clearly something else was wrong.

Fig. 1 shows the regulator circuit, which is conventional apart from the fact that the driver and error detector transistors Q702 and Q701 receive their power from the line output transformer derived boost rail. Thus for regulation to work properly the line timebase must be working. Bypass resistor R701 provides about 5-6V at switch on to enable the line oscillator to get going. Now because the voltage provided by a battery is lower than that provided by the mains rectifier (12V instead of about 15V) this start-up voltage is also slightly lower with a battery than with a mains supply. We discovered that the line oscillator transistor Q601 was lazy and would sometimes refuse to start up with this lower voltage supply. This fact, coupled with the bad contact in the battery input plug and socket, meant that if the set shut down

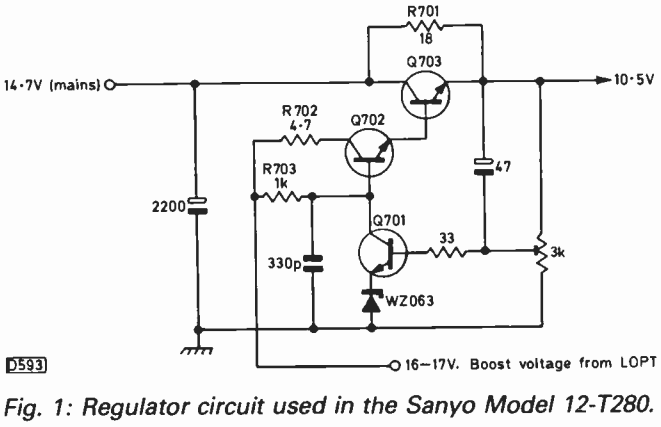

Fig. 1: Regulator circuit used in the Sanyo Model 12-T280.

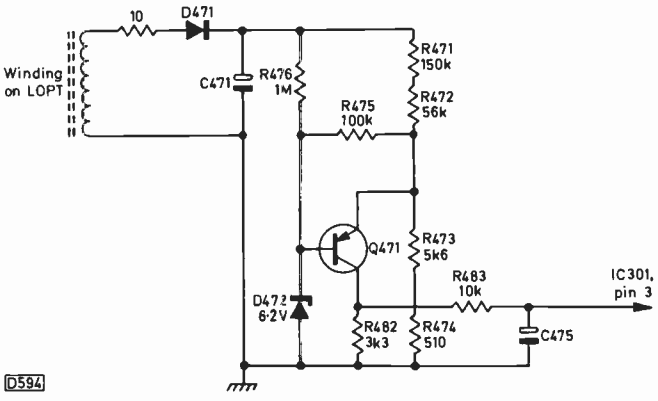

Fig. 2: Over-voltage protection circuit used in Samsung and Toshiba colour portables.

momentarily it would tend to stay shut down – as pure a case of Sod's Law (where two or more unlikely circumstances are necessary for a fault to occur these circumstances will always appear in the same set) as we've come across. A BC184L in position Q601 and a new battery lead for good measure completely cleared the problem. **R.R.**

Samsung CI330F

One of these little 14in. colour portables caused us a couple of headaches recently. For starters we had no colour, and for afters the set would go dead after a couple of hours. We first tried swapping over the plug-in decoder module with one from a working set. This still left us with no colour so we next had a look at the composite video waveform. This showed a complete lack of colour information and no burst. Even at pin 12 (video output) of the TA7611AP i.f. chip IC101 there was no measurable burst. Now we knew that the fault had to be somewhere around the i.f. chip, and that the tuner, SAW filter and the chip itself would be most unlikely to cause these symptoms, so it became a matter of substituting likely culprits with their opposite numbers from the working set. The trouble turned out to be due to the vision demodulator coil T171, probably because of an open-circuit capacitor in the can. We've had troubles in the past with the vision demodulator coil in Toshiba portables, so we had a look through our Toshiba files. Sure enough the Samsung CI330F turned out to be the Toshiba C1480B with some differences in detail. Even the component numbering followed the Toshiba pattern.

Having discovered this we were in a much better position to deal with the second fault, the set going dead after a couple of hours. This is also a typical Toshiba fault, caused by incorrect operation of the fail-safe circuit (see Fig. 2). Rectifier D471, which is fed from a winding on the line output transformer, produces across its reservoir capacitor C471 a voltage proportional to the e.h.t. R476 feeds zener diode D472 to provide a stable voltage at the base of transistor Q471, whose emitter is connected to the potential divider network R471/2/3/4. Under normal conditions the voltage at the emitter of Q471 is below that at its base so it remains off and the voltage at pin 3 of the TA7609P timebase generator chip is low. If, due to a fault, the e.h.t. rises Q471's emitter voltage will also rise but its base voltage will remain the same. It will thus switch on and the voltage at pin 3 of IC301 will rise. This shuts down the line drive and the set switches off. The usual cause of trouble is D472 going leaky, thus pulling Q471's base voltage down and turning it on regardless.

This turned out to be the case with our troublesome CI330F as well. **R.R.**

Ferguson TX90 Chassis

A peculiar fault I had recently on one of these sets was rapid field roll with sound buzz. This was eventually traced to C131 (220nF) which is connected between pin 28 of the TDA4500 chip and chassis. When tested with a meter it charged normally, but fitting a replacement cleared the fault. Putting the old one back restored the symptoms. I can only assume that the capacitor was going open-circuit when the set was powered. **D.P.**

Philips G11 Chassis

Hum on sound after a while was caused by a mechanically loose terminal on the TDA1412 12V stabiliser chip. The problem with another of these sets was a ragged picture and line dribble due to severe nicotine contamination on plug 2F between the timebase and line scan panels.

H.MacM.

Philips G8 Chassis

We've had several of these sets in recently. The fault with the first was reported as no colour after a quarter of an hour. All the usual waveforms and voltages were checked without success and we eventually found that the ident coil L7205 was just off tune. A tweak did the trick. Not a common one on this so common set.

The second set had the usual no sound or raster with the degaussing hum present. The line output transistors were o.k. so, in accordance with everyday practice, we changed the line output transformer. The first check I make is always with the ever faithful variac. This established that the set wouldn't take more than 150V a.c. from the mains supply: after that the 800mA fuse on the line scan panel blew. Picture and sound, though poor, were present with an input of 150V a.c. The cause of the problem was traced to a patch similar to a slug eating paper on the insulating pad for the line output transistors. As a result the hot collector was going to chassis at more than 150V. Similar to the G11 problem reported in the August 1986 issue.

The last one was a silly. The set was blowing 3·15A mains fuses violently. No, it wasn't what you are all saying. The heater transformer had been put in the wrong way round. **H.MacM.**

ITT CVC30 Chassis

A solution to the usual field oscillator and linearity faults with this chassis is to connect a good soldered link from point W1 on the vertical timebase board to the earth print on the main panel. Too much is expected of this connection with a panel that flops around. **H.MacM.**

VCR Clinic

Reports from Christopher Holland, Eugene Trundle, Steve Leatherbarrow and Philip Blundell, Eng. Tech.

JVC HRD140

This machine had an unusual record fault. During any recording the picture would drop out for ten-fifteen seconds periodically, leaving noise spots on the screen as though the heads were disconnected. The sound remained perfect. This fault condition might happen five or six times during a twenty minute recording. Now intermittent record faults are always difficult to deal with as you can't be certain when the problem is occurring until the tape is played back. The best approach is to monitor possible suspect circuits during the record process.

First eliminate what isn't causing the fault. In this case for example the erase oscillator appeared to be functioning as the audio recording was good. Similarly the effect on the screen during the fault condition indicated that there was an f.m. carrier going to the video heads all the time. So two d.c. voltmeters were connected to the machine, one to the record 9V line to check that this wasn't vanishing intermittently and the other to the playback 5V line to ensure that this wasn't present when it shouldn't have been. The scope was hooked to the record f.m. signal at pin 26 of IC101. Ideally another probe would have been connected to this chip's output, at pin 3, but my second probe has been playing up recently and no probe is better than an intermittent one.

The schools' programme I was recording was so interesting that I almost missed the fault when it occurred. After a few minutes the signal displayed by the scope changed to one that was obviously unmodulated carrier. A check on the recording confirmed that a dropout had occurred at the same time. The signal in question comes from pin 44 of the luminance subpanel – a small panel soldered in at right-angles to the main panel. All the connections here were resoldered, as I've had problems of this nature previously. But the fault couldn't be induced either by heating, freezing or physical movement. Further scope checks showed that the relevant inputs to the subpanel were o.k. when the fault occurred, i.e. the drum flip-flop at pin 33 and the luminance signal at pins 35, 39 and 41 (that second scope probe would have come in handy here). It all pointed to a replacement subpanel, or IC102 as JVC call it. Sure enough this provided the cure.

C.H.

JVC HRD120

This machine arrived with a tape stuck in the fully loaded position. The operate button worked, but all the functions were dead. Oh yes, and the owner was in a mad hurry to get his video back. A quick check soon revealed that circuit protector CP1 in the mechacon section was open-circuit, the cause of this being a short inside IC204. This chip governs the mode control motor which in this model loads the tape to the heads.

A replacement i.c. and circuit protector didn't provide the expected cure however. The tape was still stuck round the video heads and had to be rewound into the cassette manually. Operation of any of the function buttons caused the relevant LED to light but had no other effect. As luck would have it we had another HRD120 awaiting collection. This one had required new heads and was unlikely to be collected for some time. (Has anyone else noticed an abnormally high incidence of premature head wear on these and similar machines?) A series of comparisons between the working and faulty machines led us to the conclusion that the microcomputer chip had failed. As I'd

none in stock and the owner seemed to be ringing every half hour I did what any other rational technician would have done in the same position. But having swapped over the complete panel so as to put the problem off till another day, to my amazement the new panel produced exactly the same set of symptoms.

Now was the time for a bit of logical thinking. The original fault had been failure of the mode control motor. Was any part of this circuit not incorporated on the panel? Only the motor itself, which turned out to be open-circuit. Guess where I got a replacement motor from at very short notice . . . **C.H.**

JVC GRC1 Camcorder

We've had several of these machines with no capstan servo lock. The effect of this on playback of a good tape is the cyclic appearance of noise bars across the screen. The fault is sometimes intermittent. In each case we've found the culprit to be C113 (10μF), a chip-type tantalum capacitor which couples the control track pulses to IC104.

Cases of excessive capstan speed due to lack of the FG signal have likewise been traced to a faulty chip-type tantalum capacitor, in this case C109.

Fortunately for access, both these capacitors are on the 04 audio/servo board. These very tiny capacitors have acquired a certain notoriety, to the point where whenever one forms any part of a suspect stage we now change – or test – it on sight. These comments also apply to the GRC2 and the Ferguson equivalents 3V41 and 3V50. **E.T.**

Hitachi VT14

"Unable to tune in" said the job card. It was possible to tune the machine to the local transmissions, but the best we had was a rolling, juddering picture with bad streaking and shading. Since this was revealed via the E-E channel the problem appeared to be in the receiver section. Right at the back end of it in fact, in the form of a low-capacitance coupling capacitor (C859). This 470μF, 6·3V component has to be just the right one, since space for it is very restricted. The component bill would have been much higher if we'd replaced the preset resistor potentiometer bank, on which the owner had wrecked potentiometers two and four in his attempt to "tune in the VCR properly"! **E.T.**

Finlux VR1010/Philips VR6462

Sent to deal with a phoned complaint about no response to remote control commands our field engineer took a replacement handset with him. The replacement failed to do anything for the machine, which was still under guarantee, and back at the workshop both handsets were found to be emitting IR pulses correctly.

We were misled by the fact that a pulse train was coming into 2P9 (I^2C interface board) from the IR receiver unit, but that transistor Tr7460 was turned fully on, pulling down the voltage at pin 21 of IC7501. The culprit was the TDA3047 chip in the IR receiver module. Its output was sitting on a potential of about 4·8V, saturating Tr7460. Since the machine was under guarantee we replaced the plug-in IR receiver module complete.

E.T.

Rediffusion 640/Sharp VC468

We don't see many Rediffusion VCRs. In the event this stranger proved to be a Sharp machine in disguise. It suffered from intermittent picture rolling on playback: still-frame reproduction was also very poor. The machine was found to be capable of making a perfectly good recording, but examination of the playback f.m. carrier envelope revealed a gap of some 500μsec at the start of each sweep of head Ch. 1 only.

We found that the Ch. 1 playback switching-point potentiometer R743 was doing nothing: C725 (PG MM2 time-constant) on the PWB-A servo board had gone open-circuit. Replacement of this followed by resetting of the relevant presets restored a full f.m. envelope, good field sync and an excellent freeze-frame image. **E.T.**

Panasonic NV333

This was an under guarantee job wanted for Christmas – weren't they all! The complaint was buzzing sound. Investigation revealed that the E-E sound was almost normal, with just a little background hum. When a recording was made however the sound was very low, with bad buzzing. Many checks were made (all too embarrassing to report here!) in an effort to find the cause. A voice from someone who knows about such things suggested that a check on the regulated 17V rail would be fruitful. Sure enough, it read 18·45V. Near enough? Not so! Checks in the regulator transistor's base circuit revealed 1·2V across D1013. Replacing this item restored the 17V output, normal E-E sound and normal recorded sound. Odd that there should have been just this symptom and that the rail was only 1·45V out. **S.L.**

Finlux VR1010/Philips VR6462

If you come across one of these machines with either a sluggish brake solenoid or the head drum speed hunting, check for dry-joints around the smoothing capacitors in the power supply, particularly C2144.

Sound slow with wowing was the fault reported on one of these machines. A new servo board was tried to no avail so the capstan motor voltage was compared with that in another machine. The good one read 1·7V in play but the faulty one read 2·6V. The fault was still present after replacing the capstan motor and we then noticed that the left-hand rotary guide wasn't rotating. Replacing this cured the fault. **P.B.**

Ferguson 3V44

This machine wouldn't accept a tape, though it would eject one if you wound it in by hand. The cassette-in pin of IC601 was found to be permanently low, telling it that the cassette tray was lowered when this wasn't so. We found that there was a crack in the print by the cathode of D628 (this diode is on the print side of the board). The cathode normally goes to 5V but as a result of the crack it was earthed via R608. **P.B.**

Philips VR6660

The problem with this machine was failure to play – when the button was pressed all that happened was that the M in the display lit. Similarly, pressing stop gave still frame etc. This all pointed to a fault with the rows and columns connections to the customer controls. Luckily a few minutes spent making d.c. checks for shorts revealed a leak between K1 and K2. There was a stray piece of wire between two pins of plug C3. **P.B.**

The Computer as an Aid to Servicing

Part 2

Chas E. Miller

In the first part of this series we looked at the way in which a dBase II file is created and also discussed indexing in general terms. This time we'll take a closer look at these processes.

You'll recall that we set up our file using six fields per record. These detailed the manufacturer, model number, service data location, line output transistor and tripler types and the values of the power resistors. Suppose we wish to open the file in order to add more records, then index them.

Initial Steps

Start by loading the dBase program into the computer when the appropriate prompt is received, i.e.:

>A dBase <CR>

Up will come the preliminary information about the originator and copyright owner of the program, followed by the . prompt. To this we need to answer with the name of the file to be used. Thus:

. USE TVDATA <CR>

Or, if a dual-drive computer is being used:

. USE B: TVDATA <CR>

with the program disc in drive A and the work disc in drive B.

Note the use of upper case letters for commands. dBase II is a bit on the fussy side and may not recognise certain commands, files, etc. if the same case is not used each time. In practice it's easier to stick to upper case, especially if your keyboard has a "CAPS LOCK" facility which allows you to keep to upper case for the characters but doesn't affect the other keys such as the numbers.

Making Additions

The . prompt will now appear again. Because we want to add to the file we enter the command:

. APPEND <CR>

This will bring the record structure up on the screen, ready for the next entry, and away we go. As soon as one record is completed another "blank" one is displayed for the next.

It may well have occurred to you that recording a large number of models produced by one setmaker would be easier if the manufacturer's name (and perhaps some other details) didn't have to be typed out over and over again for each record. We can in fact do just that, by entering a command known as "SET CARRY ON".

As an admittedly extreme example we'll take the Thorn 3000 chassis, which was used in a number of models. Assume that we've just entered the FERGUSON 3703 like this:

RECORD	00006	
MAKER	:FERGUSON	<CR>
MODEL	:3703	<CR>
LOCATION	:B	<CR>
LOPTRANS	:R2008	<CR>
TRIPLER	:XYZ999	<CR>
MDROP	:M/TRANS	<CR>

At the final <CR> the new "blank", £ 00007, will appear. Press the carriage return once more, which will bring up the . prompt. Enter:

. SET CARRY ON <CR>

upon which record 00006 will reappear with the cursor at the initial letter of the maker in readiness for the first alteration, using the keys appropriate to your particular computer.

At this point we must emphasise that when the first field has been either changed or accepted as it is the cursor should *not* be moved down to the next by the carriage return: it must be moved by the appropriate cursor control key(s). The reason for this is that the carriage return would be interpreted by the computer as a signal that you've finished adding records. <CR> can however be used after the subsequent fields. In this case we'll move the cursor down to the second field and merely substitute one digit in the model number to make it 3704. After the final <CR> the same record will appear, but numbered 00008, ready for modification. The process can be carried out ad infinitum. When all the FERGUSON models have been listed you might wish to go on to list the HMV, MARCONIPHONE and ULTRA variants, in which case you'll alter the maker field as well as the model field while keeping the others unchanged.

When SET CARRY ON is no longer required, and when the final example of the string has been entered, cancel the next that's offered by an immediate <CR>. This will give you the . prompt, which should be followed thus:

. SET CARRY OFF <CR>

If you wish to add more records, follow the next prompt with

. APPEND <CR>

Should you wish to stop work for the time being, enter

. QUIT <CR>

which will exit from the program. Note that the computer may mutter to itself for a little longer as it continues to assimilate the information you've pumped into it.

Indexing

This may be a good time to create indexes for the various fields in the records, so consider what you wish to call them. If all the fields given as examples above were to be indexed, they might be called MAKIND for the setmakers, MODIND for models, LOCIND for locations, TRANSIND for transistors, TRIPIND for triplers, etc. Thus the prompt will be followed by:

. INDEX ON MAKIND FOR MAKER <CR>

The disc(s) will spin merrily and the indexing will be carried out. If there are lots of records the computer will tell you when a hundred have been indexed, and eventually when they've all been handled. The next prompt will be answered:

. INDEX ON MODIND FOR MODEL <CR>

and so on until all the required indexes have been made up.

Now let's suppose you want to ask the computer for information on a certain receiver. When the program has been loaded and the initial prompt is received you command the appropriate index to be used. We'll use our Philips G8 example again. You could of course use the

maker index to start with, but in many cases the model/chassis number is unique and only this needs to be used. Thus the response to the prompt would be:

. USE B: TVDATA INDEX MODIND <CR>
. FIND G8 <CR>
. DISPLAY <CR>

This will bring up the Philips G8 file on the screen and tell you where the service data is kept and the other informaion you might have thought worth recording. We'll assume that the tripler has blown in the set on the bench and that we need to know its type/part number. The screen display will show this to be 218 27109. If we don't keep this one in stock and need to rob a scrapper to get the repair done and earn a crust, we check which other sets use the same tripler. This can be done with the greatest of ease:

. USE B: TVDATA INDEX TRIPIND <CR>
. FIND 218 27109 <CR>
. DISPLAY <CR>

Initially just one record will come up on the screen.

When the indexing is carried out the records are listed in two ways. As will be seen when appending, each has a number, commencing with 00001. In addition the principle fields are in alphabetical order with the first (i.e. MAKER in our case) taking precedence. Now we're asking for an item which has the same initial throughout the file, which precludes alphabetical order, so receivers incorporating the required tripler will be shown in numerical order of record. For instance, if record 00007 contains the first mention of the tripler it will be displayed on the screen. Suppose that record 00007 is for a receiver you don't have in the store room and you need to have more records shown. The next prompt should be followed by:

. DISPLAY NEXT 999 FOR "218 27109" $TRIPLER <CR>

999 is specified because this will cover all the records in the file: thus all those required will be shown. The other receivers that use the 218 27109 will appear on the screen in numerical order. Should there be too many for one showing a caption will tell you to advance the display by pressing <CR>. This technique can be used for any of the indexes. Just remember to put the item required in inverted commas, followed by the dollar sign and then the name of the field concerned. Here's another example:

. USE B: TVDATA INDEX TRANSIND <CR>
. FIND BU105 <CR>
. DISPLAY <CR>
. DISPLAY NEXT 999 FOR "BU105" $TRANSIND <CR>

Corrections

Suppose you wish to check through all the records to search for errors and omissions. When the . prompt is obtained, enter:

. USE B: TVDATA <CR>
. EDIT <CR>

You will be asked to state the record number to be edited. Since you wish to check them all, start with 00001 <CR> and up it will come. You can now either amend or add to the fields, using the key technique appropriate to your computer, or accept some or all by pressing <CR>. When this is done for the last field of the record the next one (00002) will be displayed. This process can be continued until all the records have been checked.

Alternatively you can at any time leave the editing mode by using CTRL W. In some cases the computer will again ask for a record number, in which case another <CR> will cause the prompt to appear.

When only a few, known records are to be edited, follow the first prompt with (for instance):

. USE B: TVDATA <CR>
. EDIT 99 <CR>

This will bring up record 00099 for inspection and correction, etc. When you're satisfied you can either use CTRL W to leave the mode or enter <CR> to examine the next record in the file. If you wanted to go to say record 00103 it would be quicker to use the second option or to move on by means of the CTRL C keys. When the next record is a long way down the file it's better to enter the <CR> and on obtaining the . prompt to ask to edit the specific file, e.g.:

. EDIT 155 <CR>

Listing

You can always inspect your file by entering:

. LIST <CR>
. DISPLAY <CR>

This will result in all the records being displayed on the screen in turn. If you want (for example) to look at only the FERGUSON models, you would enter:

. LIST FOR MAKER = "FERGUSON" <CR>
. DISPLAY <CR>

This will bring up all the records for FERGUSON sets in numerical order. The same method can be used for any field, e.g.:

. LIST FOR LOCATION = "B" <CR>
. DISPLAY <CR>

which will list all the sets for which service information is to be found in box file B. Note that in some cases the . LIST command can be omitted and a direct order to DISPLAY entered, as follows:

. DISPLAY FOR LOCATION = "B" <CR>

By now you've probably guessed that for some applications listing is an alternative to indexes. Practical experience will soon tell you which method is better for a particular job. Incidentally you can specify more criteria if you wish, such as:

. DISPLAY FOR TRIPLER = "218 27109". AND . LOPTRANS = "BU105" <CR>

This will bring up records of only those sets that contain the specified components.

Warning

Now a word of warning. We said earlier that the dBase program is fussy over detail concerning commands. Just one little mistake will result in the computer making some snooty remark such as "unknown command" or "wrong syntax", followed by the suggestion "correct and retry? (Y/N)". My advice is to say "no" by typing in "N". This will give you the . prompt again for another go. Opting for a retry involves you in a rigmarole of typing in the original error as well as the correction, and if you happen to slip up again the process has to be repeated ad nauseam. Remember the vicar's advice to his daughter – "always say no"!

To Follow

We have still only scratched the surface of what can be done in the service department with a computer. Next time we'll examine some more time-saving systems.

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

15/80H	2.40	2SA940	1.81	2SC535	0.79	AF180	0.55	BA656	7.95	BC560C	0.14	BDX63A	1.96	BFY52	0.27	BYX71-350	1.40
15/85R	3.30	2SA940-2	2.14	2SC536	0.41	AF181	0.53	BA7100	11.35	BC635	0.36	BDY20	1.21	BFY79	0.49	BYX94	0.16
16039	0.79	2SA950	0.72	2SC537	0.54	AF186	0.53	BA841A	28.98	BC636	0.42	BDY81	1.18	BFY90	0.61	BYY56	1.20
16181	1.04	2SA951	1.26	2SC605L	1.16	AF239	0.43	BA843	3.96	BC637	0.24	BF115	0.40	BLY49	2.20	BZY93C30	1.86
16182	1.04	2SA966-Y	1.16	2SC620	1.46	AF279	0.88	BA854	5.76	BC639	0.20	BF117	0.66	BR100	0.22	BZY88 RANGE	0.10
16334	0.98	2SA999	1.36	2SC643A	1.54	AL113	1.36	BAV18	0.21	BC640	0.24	BF118	0.67	BR101	0.65	BZX61 RANGE	0.18
16335	0.94	2SB774	1.15	2SC668	0.67	AN115	3.98	BAV19	0.11	BC879	0.39	BF121	0.25	BR103	0.75	BZX79 RANGE	0.10
16446	0.98	2SB185	1.13	2SC681	4.40	AN155	1.89	BAV20	0.31	BC880	0.31	BF123	0.21	BR303	1.23	C106D	0.46
16600	1.38	2SB375	3.87	2SC682	1.88	AN206	2.58	BAV21	0.34	BCX34	0.40	BF127	0.13	BRC116	0.67	C106M	0.76
16802	1.27	2SB400	0.40	2SC684	1.65	AN208	3.55	BAW62	0.19	BCY70	0.30	BF137	0.29	BRC300	2.01	C1129	0.58
17052	5.61	2SB405	1.03	2SC693	0.63	AN210	2.28	BAX12	0.44	BCY71	0.21	BF153	0.58	BRC5296	0.77	CA3046	2.55
17053	5.61	2SB449B	6.98	2SC710	0.69	AN211	3.25	BAX13	0.11	BCY72	0.20	BF154	0.26	BRC6109	0.83	CA3089	0.83
17074	9.30	2SB511	2.50	2SC711A	0.50	AN214Q	2.75	BAX16	0.11	BD115	0.46	BF157	0.33	BRC82	1.08	CA3090AQ	3.25
17089	5.35	2SB54	1.39	2SC717	1.28	AN231	14.65	BC107	0.13	BD116	0.70	BF158	0.18	BRC83	2.19	CA3094	2.20
17127	3.51	2SB546	3.75	2SC734	1.43	AN234	5.92	BC107A	0.11	BD124	1.31	BF159	0.18	BRC84	2.08	CA3131EM	3.12
17376	1.58	2SB56	2.80	2SC761-Y	0.95	AN236	3.78	BC107B	0.18	BD124P+KIT	0.69	BF160	0.31	BRX44	0.60	CBF16848N-071	1.56
17523	1.95	2SB618A	2.22	2SC783	3.98	AN239	6.95	BC108	0.15	BD131	0.54	BF167	0.38	BRX49	0.53	CD4001	0.34
17524	1.32	2SB631	3.25	2SC790Y	1.73	AN240P	1.52	BC108B	0.15	BD132	0.42	BF173	0.34	BRY39	0.69	CD4002	0.27
1N4001	0.06	2SB643	0.61	2SC828	0.28	AN241	1.71	BC109	0.12	BD133	0.53	BF177	0.35	BSS38	0.87	CD4008	1.35
1N4002	0.06	2SB669	3.67	2SC867A	3.84	AN245	4.49	BC109B	0.15	BD135	0.36	BF178	0.40	BSTBO140G	5.25	CD4011	0.29
1N4003	0.06	2SB681	3.96	2SC876	0.96	AN253	2.97	BC109C	0.12	BD136	0.26	BF179	0.36	BSTC0246	7.25	CD4012	0.24
1N4004	0.06	2SB695	1.98	2SC930	0.54	AN260	3.85	BC113	0.14	BD137	0.36	BF180	0.36	BSTC0233	7.25	CD4013	0.47
1N4005	0.08	2SB75	1.04	2SC935	4.13	AN262	1.98	BC119	0.36	BD138	0.46	BF181	0.32	BSTCC0143	3.07	CD4016	0.46
1N4006	0.08	2SB774	0.72	2SC936	8.66	AN272	7.92	BC126	0.23	BD139	0.34	BF182	0.34	BSTD1043	2.85	CD4017	0.82
1N4007	0.07	2SB819	0.89	2SC940	4.68	AN281	6.65	BC132	0.14	BD140	0.37	BF183	0.39	BSV57B	3.49	CD4020	1.23
1N4148	0.06	2SC1034	6.75	2SD1128	2.90	AN295	5.52	BC135	0.14	BD144	1.70	BF184	0.43	BSW68	0.60	CD4021	0.39
1N4448	0.05	2SC1050	5.06	2SD1138	0.84	AN301	3.60	BC137	0.18	BD150	1.25	BF185	0.39	BSX19	1.29	CD4023	0.28
1N5401	0.14	2SC1096	1.16	2SD1273	1.25	AN302	3.99	BC138	0.34	BD157	0.67	BF194	0.14	BSX20	0.34	CD4025	0.64
1N5402	0.15	2SC1104	3.98	2SD1453	5.39	AN303	4.39	BC139	0.28	BD160	1.60	BF195	0.14	BSY52	0.50	CD4028	0.84
1N5403	0.16	2SC1106	4.54	2SD152K	2.64	AN305	11.51	BC140	0.45	BD163	0.71	BF196	0.17	BSY79	0.51	CD4040B	0.85
1N5404	0.15	2SC1114	6.75	2SD198	3.87	AN315	2.46	BC141	0.34	BD165	0.62	BF197	0.18	BT100A	1.61	CD4047	1.06
1N5408	0.35	2SC1116	4.95	2SD234	0.49	AN316	5.53	BC142	0.34	BD166	0.42	BF198	0.17	BT106	1.55	CD4049	0.46
1N914	0.04	2SC1124	1.26	2SD235	0.60	AN318	5.44	BC143	0.33	BD168	0.73	BF199	0.17	BT108	1.45	CD4052	0.75
IR3403	5.00	2SC1129	0.34	2SD24	2.29	AN320	5.47	BC147	0.08	BD175	0.60	BF200	0.37	BT119	1.76	CD4066	0.38
1S1555	0.20	2SC1131	0.64	2SD257	2.94	AN321	2.25	BC148A	0.10	BD179	0.49	BF218	0.36	BT120	2.17	CD4069	0.29
1S44	0.10	2SC1158	3.33	2SD292	2.59	AN322	5.85	BC148B	0.13	BD181	0.99	BF224	0.17	BT121	2.48	CD4070	0.66
1S5012A	0.81	2SC1162	1.05	2SD313	2.59	AN331	4.59	BC148C	0.11	BD182	0.99	BF237	0.65	BT123	1.98	CD4081	0.35
1S921	0.10	2SC1172	2.22	2SD325D	2.26	AN337	5.37	BC149	0.11	BD183	0.99	BF240	0.17	TBA970	3.06	CD4093	0.72
2N1303	0.38	2SC1195	5.80	2SD348	16.13	AN340P	1.17	BC149B	0.13	BD184	1.21	BF241	0.17	BT151-800R	1.15	CD4511	1.10
2N2219A	0.40	2SC1212A	1.97	2SD350	5.20	AN355	5.98	BC153	0.14	BD187	0.53	BF245	0.50	BTT6018	2.42	CD4528	2.04
2N2222	0.38	2SC1213	0.89	2SD350A	2.80	AN362	1.75	BC154	0.14	BD189	0.69	BF245A	0.52	BTT8124	4.89	CD4556	1.47
2N2646	0.80	2SC1226	1.46	2SD353	7.50	AN370	3.95	BC159	0.36	BD190	0.69	BF245B	0.49	BU106	2.48	CR02AM-8	1.55
2N2904	0.36	2SC1293	0.90	2SD389	2.41	AN5010	5.70	BC160	0.40	BD201	0.53	BF246A	2.52	BU108	1.50	CV12E	4.09
2N2905	0.43	2SC1306	1.98	2SD401	1.55	AN5111	2.92	BC161	0.28	BD202	0.60	BF255	0.20	BU109	2.65	CX095D	3.14
2N2906	0.38	2SC1316	10.25	2SD414	1.98	AN5120N	4.50	BC168	0.36	BD203	0.50	BF256	0.28	BU110	5.69	CX104	9.64
2N2926	0.15	2SC1317	0.87	2SD471	2.13	AN5132	4.39	BC169C	0.16	BD204	0.61	BF256LB	0.42	BU111Y	4.16	CX108	10.50
2N3053	0.27	2SC1364	0.49	2SD560	2.95	AN5250	3.98	BC170	0.16	BD207	1.79	BF256LC	0.42	BU125	2.48	CX109	7.86
2N3054	0.99	2SC1383	1.20	2SD588A	2.36	AN5435	3.08	BC171	0.11	BD208	0.34	BF257	0.34	BU126	1.55	CX130	8.76
2N3055	0.61	2SC1391	2.45	2SD600	3.25	AN5610	2.85	BC172	0.13	BD222	0.49	BF258	0.36	BU137	6.53	CX134	11.04
2N3442	1.56	2SC1398	0.94	2SD601R	0.65	AN5612	4.25	BC172B	0.27	BD225	0.49	BF259	0.34	BU205	1.08	CX136	11.49
2N3702	0.14	2SC1413A	3.05	2SD613	1.03	AN5613	4.63	BC173	0.17	BD228	0.63	BF262	0.57	BU206	1.27	CX139	11.83
2N3703	0.14	2SC1446	1.25	2SD621	12.85	AN5630	3.95	BC174B	0.27	BD229	1.05	BF263	0.57	BU207	1.65	CX157	4.84
2N3705	0.16	2SC1447	2.07	2SD636	0.55	AN5701N	1.66	BC177	0.20	BD232	0.50	BF271	0.34	BU208	1.12	CX158	4.10
2N3706	0.14	2SC1475	0.37	2SD639-R	0.77	AN6250	2.95	BC178	0.26	BD234	0.42	BF273	0.20	BU208/02	1.97	CX177	6.75
2N3707	0.16	2SC1505	1.00	2SD655	0.98	AN6300	7.00	BC179	0.26	BD237	0.47	BF274	0.20	BU208A	1.12	CX187	5.26
2N3711	0.11	2SC1514	1.41	2SD657	3.50	AN6310	8.74	BC182	0.09	BD238	0.39	BF324	0.35	BU208D	1.95	CX755	12.95
2N3771	2.04	2SC1573Q	1.25	2SD661A	0.80	AN6320N	4.28	BC182L	0.10	BD239	0.45	BF336	0.33	BU209	1.93	CX885A	6.85
2N3772	1.71	2SC1578	8.74	2SD731	2.45	AN6340	11.00	BC182LB	0.14	BD240	0.37	BF337	0.40	BU226	2.95	DEC1	2.20
2N3773	2.29	2SC1583	1.17	2SD773	0.33	AN6341	5.98	BC183L	0.11	BD241	0.39	BF338	0.44	BU326	2.00	DEC2	2.20
2N3819	0.42	2SC1617	3.89	2SD811	7.65	AN6342	1.61	BC183LB	0.26	BD242	0.39	BF355	0.49	BU326A	2.20	DS3486N	4.33
2N3823	1.17	2SC675	1.41	2SD823	1.98	AN6363	16.00	BC184	0.13	BD243A	0.37	BF362	0.66	BU326S	2.20	DS3487N	4.33
2N3904	0.62	2SC1678	1.98	2SD837	1.56	AN6371	9.24	BC184L	0.14	BD243C	0.79	BF363	0.60	BU406	1.49	E1222	0.40
2N3908	0.62	2SC1741	1.25	2SD841	3.65	AN6387	10.65	BC184LB	0.26	BD244	0.51	BF371	0.50	BU406D	1.79	E5024	0.28
2N4101	1.73	2SC1810	1.70	2SD856	2.25	AN6531	1.95	BC186	0.27	BD244C	0.79	BF391	0.25	BU407	0.82	E5386	0.25
2N4240	3.30	2SC1815	0.66	2SD857Q	1.84	AN6551	1.35	BC187	0.28	BD245C	0.99	BF417	0.84	BU407D	1.09	E9003	0.46
2N4444	1.73	2SC1826	0.65	2SD882	1.50	AN6552	0.68	BC204	0.16	BD246C	1.25	BF418	1.87	BU412	9.15	E9005	0.50
2N5293	0.50	2SC1829	3.34	2SD894	1.50	AN6610	2.40	BC207	0.14	BD253	1.05	BF422	0.29	BU426A	1.67	ESM310BP	4.15
2N5294	0.50	2SC1875	5.85	2SD898	5.45	AN6677	8.95	BC212	0.11	BD278A	0.80	BF423	0.52	BU500	1.95	FND500	5.78
2N5296	0.49	2SC1881K	2.98	2SK105H	2.15	AN7111	1.45	BC212B	0.26	BD317	2.60	BF450	0.35	BU508A	1.75	GC374	1.65
2N5297	0.50	2SC1893	3.02	2SK152	2.95	AN7114E	8.54	BC213L	0.10	BD318	2.85	BF451	0.29	BU536	5.80	GD243	4.95
2N5298	0.61	2SC1906	0.98	2SK34	0.76	AN7115	3.38	BC213LB	0.15	BD375	0.42	BF457	0.41	BU608	2.65	GF758	0.84
2N5771	1.18	2SC1921	1.37	2SK41	1.07	AN7120	4.65	BC214	0.10	BD380	0.76	BF458	0.39	BU705	1.91	GH3F	1.82
2N6109	1.58	2SC1923	1.07	2SK79	2.98	AN7145	2.80	BC214LB	0.26	BD410	0.52	BF459	0.52	BU806	1.79	HA11215	4.50
2N6130	0.72	2SC1929	2.25	40408	0.50	AN7146	4.35	BC225	0.40	BD433	0.47	BF460	0.60	BU807	0.80	HA11211	2.53
2N6133	1.25	2SC1942	4.20	40594	1.53	AN7151	2.26	BC237	0.10	BD434	0.49	BF469	0.31	BU826A	2.15	HA11225	4.29
2N6180	0.95	2SC1945	7.99	40636	1.43	AN7156	2.85	BC237BJ	0.12	BD435	0.49	BF470	0.55	BUW84	1.39	HA11226	8.71
2N6292	1.65	2SC1959	0.45	4EX581	0.80	AN7158	6.75	BC238	0.10	BD436	0.60	BF471	0.31	BUX84	1.00	HA11229	2.88
2N696	0.43	2SC1957	1.09	741	0.30	AN7218	1.64	BC238A	0.13	BD437	0.49	BF472	0.33	BUX85	1.10	HA11235	2.48
2N698	0.43	2SC1953	1.93	7805-T022	0.63	AN7223	4.25	BC238B	0.13	BD438	0.40	BF479	0.61	BUY69A	2.04	HA11124	5.25
2SA1006	1.50	2SC1962	1.93	7806	0.73	AU107	3.50	BC239	0.12	BD441	1.42	BF480	1.38	BY126	0.13	HA11244	2.82
2SA1011	1.65	2SC1969	3.10	7808	0.85	AU110	2.25	BC239B	0.25	BD442	1.41	BF491	1.99	BY127	0.08	HA11251	4.47
2SA1015	0.49	2SC1983	8.35	7812-T022	1.16	AU113	5.25	BC251A	0.31	BD509	1.42	BF495	0.64	BY133	0.11	HA1125	4.29
2SA1012	1.25	2SC1985	1.55	7815	0.64	AY105K	2.08	BC294	0.50	BD510	1.07	BF506	0.43	BY164	0.47	HA1137W	2.87
2SA1020Y	0.89	2SC2009	0.34	7818	0.92	AY106	1.09	BC300	0.35	BD519	1.50	BF509	0.41	BY176	0.52	HA1138	5.03
2SA1027R	0.45	2SC2029	2.33	7824	0.64	BA524	8.21	BC301	0.45	BD529	1.32	BF523	0.24	BY179	0.62	HA11414	5.65
2SA473	0.75	2SC2028	2.11	7905	0.80	B250	2.65	BC302	0.53	BD530	1.18	BF532	0.45	BY182	0.95	HA1144	7.87
2SA766S	4.95	2SC2063	0.99	9368	10.70	B40	1.55	BC303	1.04	BD533	0.67	BF596	0.18	BY184	0.47	HA1156	1.16
2SC1173Y	1.25	2SC2078	0.95	AA133	0.12	BA130	0.14	BC307	0.18	BD534	0.53	BF597	0.27	BY187	0.77	HA1160	4.78
2SC1474	1.25	2SC2073	2.25	AC133	0.12	BA1310	1.98	BC307A	0.14	BD535	0.79	BF694	0.22	BY189	1.79	HA1166	5.25
2SC1509	1.35	2SC2085-Q	1.40	AC123K	0.43	BA1320	1.38	BC308	0.18	BD536	0.61	BF757	0.59	BY198	1.62	HA1166X	5.36
2SD1391RL	3.95	2SC2091	1.30	AC127	0.27	BA1322	3.95	BC308A	0.11	BD537	0.74	BF759	0.47	BY201/2	1.50	HA1167	5.36
2SA1095	3.74	2SC2141	1.86	AC128	0.34	BA1330	2.75	BC309	0.17	BD538	1.45	BF761	1.05	BY203/20	0.59	HA11706	9.50
2SA1103	6.55	2SC2166	1.98	AC138	0.24	BA145	0.19	BC317A	0.13	BD544B	0.83	BF762	0.75	BY207	0.22	HA11705	8.00
2SA329	0.40	2SC2216	0.69	AC141	0.29	BA148	0.25	BC327	0.15	BD598	1.25	BF869	0.47	BY208	0.46	HA11703	4.95
2SA351	1.17	2SC2233	2.20	AC142K	0.44	BA154	0.40	BC328	0.11	BD677	0.56	BF870	0.30	BY210-400	0.19	HA11701	4.56
2SA489	1.17	2SC2236	1.65	AC151	0.28	BA155	0.12	BC337	0.09	BD679	0.57	BF959	0.42	BY210-600	0.27	HA11710	9.50
2SA490	2.25	2SC2278	1.69	AC176	0.30	BA156	0.05	BC338	0.34	BD680	0.76	BF960	0.69	BY210-800	0.34	HA11713	9.75
2SA493	2.25	2SC2314	2.17	AC179	0.28	BA159	0.15	BC368	0.24	BD681	1.48	BF970	0.69	BY218	1.64	HA11711	20.16
2SA562	0.57	2SC2335-KI	10.41	AC183	0.72	BA182	0.24	BC440	1.09	BD696	2.47	BFR39	0.44	BY223	1.23	HA11715	3.25
2SA564	0.75	2SC2551	1.26	AC187	0.39	BA222	1.66	BC441	0.44	BD699	3.49	BFR61	0.50	BY224-600	1.88	HA11714	7.76
2SA614	4.88	2SC2565	3.92	AC187K	0.43	BA302	1.24	BC454	0.36	BD700	3.70	BFR62	0.50	BY225-100	1.13	HA11716	13.10
2SA628	1.14	2SC2570	1.85	AC188	0.49	BA311	1.32	BC460	0.42	BD707	1.06	BFR79	0.29	BY226	0.25	HA11725	18.26
2SA639S	1.75	2SC2577	3.58	AC188-01	0.49	BA312	0.97	BC461	0.47	BD709	1.12	BFR81	1.65	BY227	0.49	HA11725MP	16.00
2SA659	0.49	2SC2578	6.75	AC188K	0.43	BA313	0.76	BC462	1.15	BD710	0.80	BFR86	1.08	BY228	0.60	HA117555P	6.23
2SA673	1.50	2SC2671	1.99	AC193K	0.65	BA317	0.08	BC463	0.64	BD809	0.85	BFR89	1.63	BY229-1000	1.12	HA11781	8.90
2SA684	1.61	2SC2826	2.07	AC194K	0.65	BA318	0.09	BC477	0.37	BD810	0.69	BFR90A	1.20	BY229-600	0.92	HA1180	5.15
2SA697	0.82	2SC288A	1.85	AD140	1.06	BA328	4.77	BC478	0.32	BD879	0.74	BFT42	0.43	BY255	0.69	HA1196	7.43
2SA699	1.75	2SC3153	5.26	AD143	1.41	BA333	1.37	BC479	0.41	BD880	0.79	BFT43	0.43	BY295-600	1.03	HA13001	2.25
2SA715	0.95	2SC372	1.40	AD145	1.60	BA335	6.27	BC532	0.28	BD895	2.31	BFT84	0.40	BY298	0.20	HA1306	2.26
2SA747	8.26	2SC373	1.16	AD161	0.56	BA5102A	2.86	BC546	0.17	BD899	2.48	BFW10	0.60	BY299	0.45	HA1338	7.50
2SA748	1.36	2SC383	1.33	AD162	0.45	BA511	2.92	BC547	0.10	BD901	0.79	BFX29	0.34	BY407	0.90	HA1339	2.33
2SA817	0.65	2SC388	0.50	AD262	1.25	BA514	2.20	BC548	0.10	BD902	0.84	BFX84	0.37	BY409	1.49	HA13402	7.87
2SA818	1.82	2SC394V	0.81	AF114	2.47	BA521	2.52	BC549	0.10	BDW83C	1.56	BFX85	0.41	BY448	1.35	HA13342	2.65
2SA835	2.50	2SC403C	0.60	AF115	1.24	BA524	8.94	BC550	0.10	BDW84C	1.56	BFX86	0.36	BY713	1.10	HA13365	4.02
2SA836	0.89	2SC41	2.19	AF118	1.20	BA526	7.98	BC556	0.16	BDX32	1.75	BFX87	0.55	BYW19/1000	0.69	HA1366WR	1.86
2SA844	0.65	2SC458	0.39	AF127	0.50	BA527	2.98	BC557	0.10	BDX53A	4.93	BFX88	0.34	BYW56	0.34	HA1367	4.32
2SA872	0.70	2SC495	0.92	AF139	0.53	BA532	1.56	BC558	0.10	BDX53B	2.85	BFX89	0.44	BYX10	0.29	HA1368R	2.45
2SA884	2.15	2SC515A	2.85	AF178	1.45	BA536	2.95	BC559	0.10	BDX54B	2.16	BFY50	0.32	BYX55-600	0.19	HA1368	2.07
2SA937R	0.97			AF179	0.55	BA6209	5.52	BC559B	0.11	BDX62A	2.15	BFY51	0.50	BYX71-600	0.90	HA1370	3.71

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE MODEL LOCATION. REMEMBER TO ADD 0.60p POST & HANDLING. ADD 15% VAT TO TOTAL

TEL 0902 712083 TELEX 338490

HA1374	4.80
HA1377	4.98
HA1389R	2.05
HA1389	2.39
HA1392	3.90
HA1394	3.95
HA1397	3.76
HA1398	3.98
HA1406	2.07
HA1452	1.63
HBF4030AF	2.48
HD14538	2.07
HD38702-A2	7.45
HD38750A53	8.95
HD38750A-7	7.25
HD38800A50	14.09
HD44801A05	18.25
HEF4001BP	0.67
HISH1010	8.59
HISH1004	6.00
HISH1002	9.50
HM6231	9.81
HM6232	8.89
HM6251	5.70
HM7103	4.85
HM9032	3.22
HM9012	3.22
HM9015	3.24
HT4207	17.16
HT4208	18.25
IN5401	0.11
IR2403	4.25
IR2C05	4.25
IR3P06	2.25
IR3P08	4.95
IR94558	6.25
IS751	2.05
ITT425	0.18
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IZ0020GE	5.93
K174YP	3.46
KA2101	2.92
KC581C	6.32
KC582C	3.97
KC583C	5.54
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LA1210	1.56
LA1230	2.87
LA1320	2.87
LA1352	1.75
LA1357N	11.07
LA1363	1.05
LA1364	3.02
LA1365J	3.44
LA1385	1.94
LA1387	7.60
LA3155	1.25
LA3301	1.65
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LA3361	1.23
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LA4031P	3.20
LA4032P	2.35
LA4100	1.25
LA4101	1.30
LA4102	2.81
LA4112	1.56
LA4125	2.25
LA4138	3.45
LA4140	1.15
LA4192	4.29
LA4220	1.62
LA4250	6.75
LA4400	3.92
LA4420	1.72
LA4422	1.72
LA4430	1.56
LA4440	2.95
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LA4460	2.32
LA4461	2.95
LA4505	7.25
LA5112N	2.98
LA7020	13.06
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	3.58
LA7800	2.65
LA7801	1.92
LB1274	3.08
LC7800	9.20
LD3120	1.13
LD3150	2.25
LM1017N	4.29
LM1877	10.92
LM224	1.75
LM2808	6.25
LM2877	5.25
LM317CKC	1.38
LM324N	0.75
LM339N	0.80
LM340K	11.85
LM342P	1.62
LM342P	1.62
LM342P	1.62
LM348N	2.15
LM380N	2.80
LM384N01	3.25
LM567CN	1.71
LM6402/011	10.23
LM6402A093	10.15
LM748	1.82
LM8360	3.87
LM8361	3.57
LR2612	11.95
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	5.95
LU52011	14.95
LU03112	12.37
M193	12.75
M21C	1.00
M23C	0.83
M293	9.15
M51102L	6.35
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M51203L	3.15
M51231P	3.04
M5134-9341	4.13
M51353P	5.25
M51381P	5.09
M51393AP	9.35
M51394P	11.97
M5142P	5.49
M5144P	4.25
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M51515BL	3.23
M51517L	3.71
M5192	2.20
M5194AP	5.74
M5231L	1.95
M53274P	1.33
M54532P	2.15
M54544L	4.75
M58478P	6.75
M58485P	13.65
MA06	1.07
MA8001	0.82
MA8003	1.16
MB3705	1.98
MB3712	1.85
MB3713	1.69
MB3730	2.94
MC13002	3.69
MC1310P	2.25
MC1327P	1.33
MC1330P	2.88
MC1350P	1.61
MC1351P	3.96
MC1352P	2.50
MC1357P	2.15
MC1358P	1.55
MC14001	2.40
MC14013	0.41
MC14493P	11.95
MC14494P	2.15
MC14497	3.65
MC14510BAL	3.75
MC14511BCP	1.10
MC14528BCP	2.70
MC1712	3.88
MC5192	19.50
MC7724CP	3.49
MC7818C	2.18
MCR100/7	1.65
MCR106-5/6	0.95
MCR220/7	2.28
ME0402	0.17
ME0404/2	0.47
ME0411	0.28
ME6002	0.26
ME6102	0.28
ME8001	0.34
ME0411	0.75
MJ2501	3.30
MJ3001	1.76
MJ481	1.53
MJ802	5.45
MJE2955	1.89
MJE3055	1.65
MJE340	0.49
MJE520	0.49
ML231	3.33
ML232B	3.65
ML237B	2.51
ML238	5.77
ML923	3.35
ML926	3.98
MM5314N	4.02
MM5316N	9.16
MM5318N	3.11
MM5369N	2.01
MM5387AA/N	6.20
MM5841N	6.64
MN1400VL	13.65
MN1405	12.95
MN1435VX	11.48
MN6016A	20.56
MP1192	5.07
MP2794	4.00
MP2812	5.07
MP8512	1.57
MPC596	2.13
MPF256C	0.60
MPS6570	0.48
MPSA42	0.65
MPSA56	0.27
MPSA92	0.49
MPSU05	0.86
MPSU10	1.56
MPSU56	0.78
MPSU60	1.98
MR818	0.33
MR854	0.72
MR914	1.20
MSM5816RS	17.35
MSM5840H	9.25
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NE542	2.50
NE545B	4.86
NE555	0.38
NE556	0.95
NE565N	1.33
NE645BN	3.35
NP1106	8.60
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OA47	0.16
OA91	0.09
OA95	0.12
OC28	2.95
OC29	2.15
OC36	1.28
OC44	0.35
OC45	0.18
OC72	0.44
OC75	0.44
DN236	1.06
ON782	1.98
OT121	1.45
PT6042	2.45
PT8504	4.98
R1038	2.19
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	1.33
R2029	1.33
R2030	1.33
R2257	3.71
R2265	1.49
R2305	1.18
R2322	0.59
R2323	0.76
R2354A	2.01
R2354B	2.01
R2443	0.88
R2461	1.50
R2540	2.31
R2540X	3.30
R2615	0.67
RCA16029	2.01
RCA16600	1.38
RCA16802	1.08
RCA17074	6.60
RCA17376	1.58
RCA17524	0.83
RCA17523	0.83
RCA2060	2.00
RGP01-15	0.70
RGP10	0.50
RGP30M	0.59
RT402	1.58
RT905A	2.38
S1299	7.98
S175	31.48
S2062D	2.07
S2800D	5.54
S2802	3.47
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S3702S	6.15
S40W	16.68
S6080B	8.80
SA8063	5.17
SAA1006	1.75
SAA1020	4.76
SAA1025	4.40
SAA1024	2.81
SAA1075	6.25
SAA1121	7.44
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SAA1130	4.99
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SAA1250	4.25
SAA1251	5.85
SAA11351	4.95
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SAA5010	5.39
SAA5012	5.20
SAA5020	5.78
SAA5030	8.25
SAA5050	7.74
SAB1009B	5.98
SAB3011	7.34
SAB3013	5.61
SAB3021	7.90
SAB3024	6.36
SAB3209	5.82
SAB3210	3.49
SAF1032P	5.50
SAF1039	3.35
SAS5010	8.39
SAS560S	2.26
SAS560T	5.42
SAS570T	5.42
SAS570S	2.61
SAS580	2.85
SAS6600	1.33
SAS660	2.97
SAS6700	1.33
SAS670	3.96
SAS6710	1.93
SBA750	1.61
SC84203	19.35
SC9504P	1.95
SDA2006	18.95
SDA2112/2	12.85
SG264A	6.45
SG613	8.87
SG629	8.27
SG6533	11.96
SI-1020H	10.89
SI-1125HD	17.63
SI1125H	7.50
SI1225HD	19.27
SI1630HD	21.98
SI6900	12.00
SKE1/02	1.85
SKE2F1/04	1.39
SKE2G3/04	1.05
SKE4F1/06	0.73
SKE4F2/08	1.24
SKE4F2/06	0.85
SKE4F2/10	1.24
SKE4G2/02	0.96
SKE5F3/10	1.60
SKS1/10	2.15
SL1310	3.14
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SN29717N	7.19
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SN7401N	0.36
SN7402N	0.65
SN7404N	0.24
SN7408N	0.27
SN7410N	0.27
SN74121	1.60
SN7413N	0.37
SN74141N	2.65
SN74151AN	1.51
SN74154N	1.27
SN74190	2.80
SN7420N	0.34
SN7430	0.49
SN7440N	0.27
SN7472	1.54
SN7474N	0.44
SN7490AN	0.93
SN74LS26N	0.53
SN76001N	1.65
SN76013ND	7.50
SN76023N	5.15
SN76023ND	3.96
SN76033N	4.15
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SN76115AN	1.61
SN76131	1.92
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SN76546N	3.47
SN76549	2.59
SN76570	3.08
SN76611	2.59
SN76620	2.59
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SN76708	4.86
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SN76730	5.36
SN76810N	0.60
SN76832N	3.25
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SN94042	5.54
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STA401	6.76
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STA471C	7.56
STK0029	5.54
STK0039	5.11
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STK0050	7.72
STK0080	9.16
STK011	5.08
STK013	9.25
STK014	9.80
STK015	7.75
STK016	8.45
STK022	5.25
STK025	12.50
STK031	12.95
STK040	9.40
STK043	13.44
STK054	7.13
STK058	16.25
STK077	7.67
STK078	8.91
STK080	16.50
STK082	11.86
STK086	13.59
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STK2110	7.33
STK2145	16.25
STK2230	7.70
STK2240	14.40
STK2250	18.95
STK3042	10.25
STK3044	5.75
STK4019	4.50
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STK433	6.25
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TA7640AP	1.55
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TBA730	3.55
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TBA810S	1.61
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TBA810AS	1.00
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TC4071BP	2.76
TC4081BP	3.25
TC40H000	1.98
TC4514BP	5.44
TC9002BP	14.50
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TCA660B	3.30
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TCA800Q	6.95
TCA830S	2.38
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TDA1905	1.76
TDA1908	2.87
TDA1940	1.95
TDA1950	2.95
TDA2005	5.08
TDA2006	1.55
TDA2004	2.27
TDA2002	0.90
TDA2003	1.75
TDA2010	1.85
TDA2020	2.77
TDA2030	1.99
TDA2140	1.59
TDA2150	6.20
TDA2151	2.07
TDA2160	4.01
TDA2161	1.85
TDA2170	3.45
TDA2270	4.65
TDA2510	7.85
TDA2520	2.37
TDA2522	3.46
TDA2524	4.50
TDA2521	3.71
TDA2525	3.80
TDA2532	2.50
TDA2530	2.70
TDA2541	2.48
TDA2540	2.15
TDA2545Q	5.94
TDA2560	2.17
TDA2575A	0.50
TDA2571AQ	3.60
TDA2576A	2.85
TDA2571A	3.66
TDA2578A	4.95
TDA2576A+K	12.35
TDA2581	1.98
TDA2582	2.18
TDA2591	2.50
TDA2594	3.26
TDA2593	2.47
TDA2591Q	0.83
TDA2595	3.65
TDA2600	5.50
TDA2611AQ	2.98
TDA2612Q	4.68
TDA2611A	1.25
TDA2610	2.79
TDA2620	2.15
TDA2630	1.96
TDA2631	2.73
TDA2640	2.95
TDA2652	13.45
TDA2653	3.65
TDA2654	6.18
TDA2670	2.54
TDA2680	3.20
TDA2690A	2.65
TDA2740	6.00
TDA2780AQ	5.14
TDA2795	2.78
TDA2791	2.5
TDA2910	13.25
TDA3000T	2.55
TDA3300B	6.98
TDA3330	3.30
TDA3506	7.98
TDA3501	7.25
TDA3500	4.25
TDA3510	6.55
TDA3520	9.71
TDA3540	6.99
TDA3541	3.80
TDA3560	5.25
TDA3571Q	2.97
TDA3576	7.09
TDA3590	5.79
TDA3591	6.45
TDA3650	7.50
TDA3652	5.44
TDA3651AQ	2.96
TDA3651	3.30
TDA3651A	2.75
TDA3950	3.40
TDA4050B	3.95
TDA4280	7.20
TDA4290	4.47
TDA4400	2.27
TDA4420	4.02
TDA4422	5.04
TDA4427S	9.00
TDA4431	2.27
TDA4440	2.87
TDA4442	4.75
TDA4500	4.96
TDA4600	2.84
TDA4610	4.80
TDA4620	4.78
TDA5500	4.78
TDA5700	2.75
TDA7270S	2.25
TDA8190	3.47
TDA9403	3.15
TDA9503	2.92
TDA9513	5.44
TDB1033	6.68
TDE1081	7.05
TE626	1.49
TEA1002	3.47
TEA1009	1.86
TEA1014	3.30
TEA1020SP	8.21
TIC106C	0.61
TIC106M	0.77
TIC116Y100	2.07
TIC44	0.72
TIC45	0.77
TIC47	0.35
TIP120	1.06
TIP110	0.53
TIP112E	0.85
TIP112	0.88
TIP117	0.95
TIP121	0.87
TIP126	0.73
TIP132	1.40
TIP137	1.50
TIP29	0.84
TIP2955	0.95
TIP29A	0.46
TIP29B	0.63
TIP29C	0.40
TIP29D	0.75
TIP3055	0.75
TIP30A	0.41
TIP30C	0.16
TIP31A	0.34
TIP31B	0.38
TIP31C	0.50
TIP32A	0.53
TIP32B	0.69
TIP32C	0.40
TIP33	0.85
TIP33A	1.05
TIP33C	0.80
TIP34	3.54
TIP41A	0.49
TIP41B	0.65
TIP41C	0.49
TIP42A	0.49
TIP42B	0.53
TIP42C	0.70
TIP47	0.65
TIP48	0.92
TIP49	3.61
TIP55A	3.65
TIS43	1.43
TIS90	0.28
TL011CP	1.55
TL072	2.85
TL494CN	8.75
TLD72CP	2.55
TMP4320	15.00
TMS1024NLL	11.25
TMS1025N	16.95
TMS3720ANS	19.50
TMS3748NS	14.95
TMS3755	13.65
TMS3894NL	19.25
MS5102NLL	6.25
TUA2000	8.98
TV106	1.86
TY6010B	2.97
U05G	1.14
ULN2204	11.45
UPA53C	4.94
UPC1003	5.95
UPC1009C	8.95
UPC1025H	3.00
UPC1026C	1.24
UPC1028H	2.00
UPC1020H	2.77
UPC1032H	0.62
UPC1042C	8.95
UPC1156H	2.96
UPC1158	5.84
UPC1161C	4.50
UPC1182H	1.82
UPC1186H	1.05
UPC1181H	1.25
UPC1185H	1.95
UPC1188	6.95
UPC1213C	1.25
UPC1212C	1.72
UPC1225H	3.25
UPC1230	5.24
UPC1238	4.09
UPC1263	4.09
UPC1277H	5.85
UPC1278H	4.85
UPC1351C	1.81
UPC1350C	1.40
UPC1353	7.85
UPC1355C	2.13
UPC1363	4.20
UPC1362	2.98
UPC1365C	6.98
UPC1366	7.25
UPC1360C	4.51
UPC1378H	4.25
UPC141C	3.75
UPC1458	8.66
UPC151C	2.95
UPC2002	1.48
UPC30C	2.51
UPC324C	4.70
UPC32C	5.25
UPC339C	4.90
UPC41C	4.10
UPC4558C	2.15
UPC474	5.11
UPC554C	1.85
UPC566H	2.95
UPC574	3.25
UPC575C2	2.40
UPC576H	2.58
UPC577H	1.25
UPC578C	8.70
UPC580C	4.13
UPC587C2	1.34
UPC592H	2.15
UPC595	2.95
UPC596	1.98
UPD1514C	8.95
UPD2819C	4.98
UPD4013B	4.00
UPD4066B	4.95
UPD553-164	19.25
UPD8049C-1	11.50
X0007TA	4.68
X0022CE	5.75
X0029CE	7.09
X0031CE	4.95
X0035TA	5.98
X0040TA	4.50
X0042CE	4.35
X0043CE	2.75
X0056CE	6.25
X0057GE	6.00
X0062CE	6.52
X0065CE	6.25
X0074GE	10.00
X0077GE	15.96
X0079CE	4.95
X0092CE	4.95
X0096CE	5.98
X0109CE	11.25
X0113CE	2.07
X0195CE	7.50
X0204CE	8.74
X0261CE	8.75
X1222AF	3.63
IX0111CE	2.95
Y969	0.82
TDA3310	2.15
ZPY120	3.25
ZTK33	0.43

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The 8mm Video System

Part 1

Eugene Trundle

The established VHS video format has become very well entrenched: there are now several compatible variants such as Hi-Fi sound, LP mode, HQ specification, the VHS-C system for use in compact portable equipment and the recently announced S-VHS system with much improved resolution. Neither of the competing Betamax and V2000 formats was able to make much impression on VHS's predominant position in the market. In mid-1985 a new format appeared in the UK, being used initially in camcorders such as the Sony CCD-V8. Unlike all the previous formats this system was developed by a consortium of companies and accepted for use by over 127 of the world's major audio/video manufacturers. As a newcomer it has the benefit of being able to make use of several new technologies – there's also considerable potential for further development. It is for example the first domestic video recording system to use digital audio recording, and the first to be designed from the outset for an alternative mode of operation – as a high-quality digital sound only record/playback system. Its other advantages are an extremely small cassette, which means that the equipment, whether portable or for domestic use, can be very compact; the absence of any stationary heads and control tracks; the use of a flying erase head for cleaner edits; and the exploitation of new types of magnetic tape to give longer playing times and better performance.

Given the decision to use a narrower tape than with previous formats it's possible that opting for a width of 8mm was done with amateur cine enthusiasts in mind – capture of the home-movie market is one of the primary aims of the companies marketing Video 8 equipment.

Tapes

Two types of tape are used with the system, MP (metal powder) and ME (metal evaporated). The two types are illustrated in Fig. 1. With MP tape the magnetic coating consists of a powdered alloy of iron mixed with nickel and cobalt. The coating is applied by passing the base film over a gravure roller that rotates in a bath of "magnetic paint". With the alternative and better ME type the coating consists of a very thin layer of evaporated metal, again an alloy of iron with nickel and cobalt. The ME tape manufacturing process is rather more difficult. The base film is passed over a roller in a vacuum chamber in which the magnetic coating is evaporated on to the surface of the tape using heat and an electron beam. ME tape has a very small magnetic particle size and offers a signal-to-noise ratio some 10-12dB higher than that of standard ferric oxide tape. High-density, low-noise recording is thus made possible. The recording current, bias and erase requirements are very different from those of conventional tapes.

The Cassette

A photograph showing a Video 8 cassette along with, for comparison, a standard audio compact cassette is shown in Fig. 2. The record-protection system is the two-position switch at the bottom right: the switch is pushed to the left for record inhibition. Table 1 lists details of the various types of 8mm cassettes available. The cassette housing itself contains no internal tape guide pins and only a very simple reel-braking device.

Fig. 3 shows the underside of the plastic cassette shell. At the centre there's a reel-lock release hole, and towards the front centre there's a hole through which the end-sensor source LED protrudes – tape end detection is optical with this format. Four widely spaced positioning holes A/B/C/D locate the cassette very accurately on the deck. While it's being lowered into position the front flap is released by the lid-lock lever. The two groups of three holes under the rear corners are to convey information to the VCR about the tape. One is closed by the record-safety switch; a second indicates the tape type, MP or ME, in order to switch the record signal currents as necessary; a third indicates tape thickness, for correct regulation of the tape tension. The three spare holes have not as yet been assigned: they will probably be used for indications such as programme type, i.e. audio/video, etc. The size of the cassette is just 95 × 62·5 × 15mm, so several can be carried in one pocket. A comparison of the cassettes used with the different VCR formats is given in Table 2. In general, prerecorded Video 8 software is available in the LP (long-play) mode, in which the recorded programme exceeds the normal sixty or ninety minutes SP (standard play) tape running time. Recognition of mode and tape speed is done automatically, by sampling off-tape, track-following tones during playback (see later). The tape counter and time-remaining indicators are driven by a microcomputer chip that operates in conjunction with the reel turntable sensors.

Deck Layout and Tape Threading

Basic VCR formats don't dictate the deck layout, threading system or even the head diameter – as is demonstrated by the many Betamax and VHS variants to date. So far all V8 decks, apart from those used in the smallest camcorders, employ the arrangement shown in Fig. 4, in which the head drum is surrounded by a threading ring. Except for the record-only Handycam, the threading process is a combination of M-wrap and U-wrap techniques. Since it starts threading like a VHS machine then "does a Beta" one is tempted to conclude that the arrangement was decided upon at a particularly stormy

Table 1: Standard 8mm cassettes.

Type	*Tape length*	*Tape thickness*
P5-30	38m	13μ
P5-60	75m	13μ
P5-90	113m	13μ
E5-60	75m	10μ
E5-90	113m	10μ

Explanation of type numbering: The initial letter indicates the type of tape – P = metal powder, E = metal evaporated. The following figure indicates the TV standard – 5 = PAL 50/625, 6 = NTSC 60/525. The final figures indicate the SP running time in minutes.

Table 2: Comparison of video cassettes.

	V2000	*VHS*	*Beta*	*VHS-C*	*Video 8*
Size (mm)	183 × 110 × 26	188 × 104 × 25	156 × 96 × 25	92 × 59 × 23	95 × 62·5 × 15
Volume (cc)	523	489	374	125	89
Max. SP time (hrs)	8	4	4	0·5	1·5
SP recording density (hrs/m^2)	1·79	0·93	1·16	0·93	1·67*
Thickness of tape (μm)	21	21	21	21	13/10†

* Effectively doubled by use of "half-thickness" tape.
† See table 1.

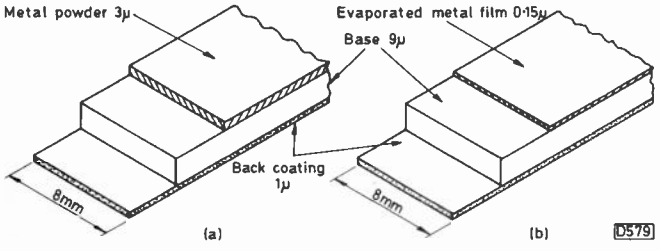

Fig. 1: Structure of the two types of metal tape used with the 8mm video system: (a) metal powder – MP; (b) evaporated metal – ME.

Fig. 2: Video 8 and compact audio cassettes compared. The sizes and weights are similar. In the audio-only mode the Video 8 tape can accommodate up to 18 hours of very high quality audio sound – the audio cassette has a 90 minutes maximum capability for ordinary stereo reproduction.

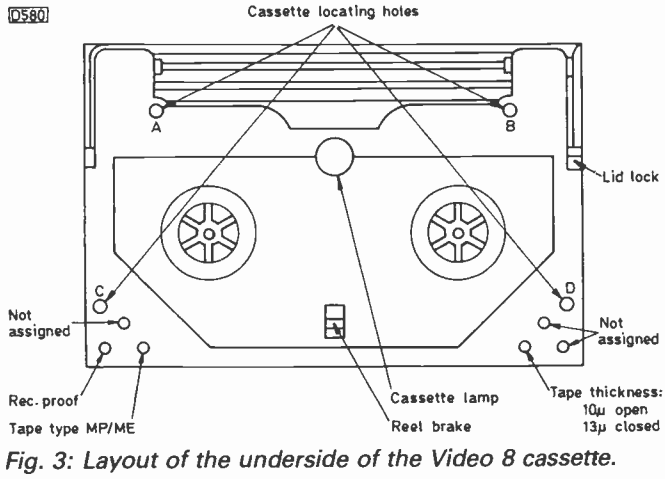

Fig. 3: Layout of the underside of the Video 8 cassette.

committee meeting of protagonists from Europe and Japan! In fact however it's a practical and reliable way of achieving the required head wrap.

The three progressive stages in the loading process are shown in Fig. 4. The "loading standby" situation, with the lid open, is shown at (a). When a cassette is lowered on to the deck the pinch roller and several tape guides penetrate between the tape loop and the cassette body. The first stage in the threading sequence is shown at (b). Two arms move away from the cassette, each carrying a post. A loop of tape is in this way drawn out in M-wrap fashion. When the arms are fully extended the loading ring begins to move anticlockwise, initially picking up the tape on a guide just ahead of the pinch roller, then spacing it out on two further ring-mounted guides. After about 210° of rotation – see Fig. 4 (c) – the ring stops with the pinch roller opposite the capstan and the tape wrapped approximately 220° around the head drum.

With the Handycam there's no room for even this compact arrangement! In this case the cassette, complete with cradle and spool drive system, is drawn into the machine electrically, closing and locking two loading-arm guide slots in similar fashion to a sliding, retractable bridge. Two guide posts then traverse the slots to load the tape to points on each side of the head to give a 180° wrap, in exactly the same way as with a conventional VHS machine.

Apart from the absence of any stationary heads the mechanics in other respects follow conventional modern practice for miniature decks: small, flat, direct-drive motors are used for the drum and capstan; deck status is indicated by a rotary mode switch; and a low-energy solenoid is used for the main brake. A record is perhaps established by the fifteen wires that enter the tiny capstan motor! Deck machines are front loaders, camcorders (including the two-stage-load Handycam) being top loaders.

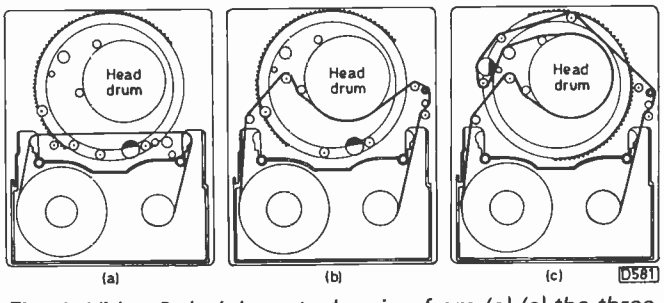

Fig. 4: Video 8 deck layout, showing from (a)-(c) the three-stage tape loading process.

Details of the Video 8 tape path and guides will be given in a later instalment. We'll also give setting-up instructions.

Format Details

Like all domestic VCRs, Video 8 machines use helical tape scanning, a two-head rotary drum laying down one TV field per half revolution. The head drum is 40mm in diameter and rotates anticlockwise at 1,500 r.p.m. In the standard play mode the tape travels anticlockwise around the drum at a speed of 2·051cm/sec. Though the long-play mode is not part of the basic format specification, all machines so far are equipped for it: in this case the tape travels around the drum at 1·058cm/sec. There's provision for narrow longitudinal tracks along the top and bottom edges of the tape for cue signals and auxiliary sound, but these features have not been used in any of the first models to be released – the reproduction quality from the 0·5mm auxiliary sound track would be very poor, especially in the LP mode, but it would be usable for commentary prompts, editing instructions and the like.

Since the erase head (in "flying" form) is fitted to the head drum and the sound is recorded by the video heads no stationary head assembles are required. Tape end sensing is optical: a central LED shines through a clear leader at each end of the tape. The basic specification for the PAL version of the format is summarised in Table 3.

Writing Speed

The tape-to-head writing speed is 3·12m/sec, rather slower than with previous systems that averaged around 5·25m/sec. Maintenance of good performance at this lower speed is due to the tape and head characteristics: the heads have very narrow gaps and use relatively high f.m. recording frequencies, as we shall see. The combination of high carrier frequency and low writing speed makes for very short wavelengths in the recorded magnetic tracks: this is why new types of tape with small particle size are required.

Video Track Characteristics

In the standard play mode the width of each helical video track is 34·4 microns. This narrows to 17·2 microns in the LP mode. The system is nominally a zero guard band one, and the head gaps have a ±10° offset azimuth to minimise crosstalk between tracks. With such narrow tracks the mechanical tolerances of the deck components and the tape dimensions have to be kept to within very close limits and a sophisticated automatic tracking system is required – we'll come to this shortly. The same pair of heads are used in both the SP and LP modes, their gap length (*effective* head width) being approximately 27 microns. This means that there's a guard band of about 14 microns width between SP tracks: during LP recording the excess width of each track is erased (over-written) by the normal recording action of the following head sweep.

Table 3: PAL Video 8 format specifications.

Characteristic	*PAL-SP*	*PAL-LP*
Tape width (mm)	8	8
Tape speed (mm/sec)	20·51	10·58
Writing speed (m/sec)	3·12	3·13
Drum diameter (mm)	40	40
Video track pitch (µm)	34·4	17·2
Cue track width (mm)	0·5	0·5
Aux. audio track width (mm)	0·5	0·5
Video track angle (running)	4°54′58·8″	4°54′02″
Video track angle (stopped)	4°53′06″	4°53′06″
Head gap azimuth angle	±10°	±10°
Track H-alignment	1H	2H

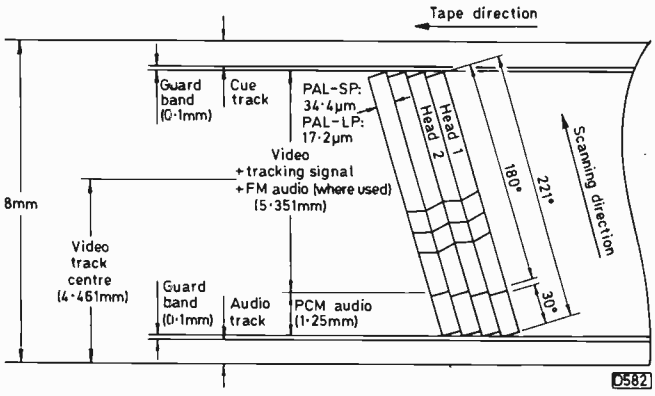

Fig. 5: Track layout on Video 8 tape.

The main effect of this is seen in the camcorder models, which have no trick-speed heads: in SP mode freeze frame (playback pause) there's a noise bar due to the guard bands and picture flicker because head two reads nothing from the tape. In the LP mode the freeze frame gives a better image. Similarly, SP mode picture search functions (cue and review) are characterised by wide noise bars, whereas LP mode search gives the usual narrow noise bars. Home-based (deck-type) machines are not affected in these ways as they incorporate a trick head. This is an extra-wide head, designated Ch.1′, on the same chip as the Ch.2 head but cut with an identical azimuth angle to the Ch.1 head. In the trick modes (Sony call them "jog" modes) the playback signal is taken alternately from the Ch.1 and Ch.1′ heads.

Track Layout and Head Wrap

The video tracks are laid down at a small angle (about 5°) to the plane of the tape, and one 20msec video field occupies 180° of head rotation. The linear tape speed and track angle are such that the video tracks so written do not extend across the full tape width, as Fig. 5 shows. In fact the tape width used for the video tracks is only 5·351mm. A further 1·25mm (representing approximately 30° of head rotation) is reserved for PCM (pulse code modulation) audio recording. The total tape wrap around the head drum is about 221°.

The heads start their tape scan at the bottom edge of the tape and (in machines equipped for PCM operation) spend the first 30° of their traverse across the tape writing or reading PCM audio signals. They then revert to video for the following 20msec/180°. During the PCM tape scanning period both heads are in contact with the tape and recording or reading different information, so signal switching of the head circuits is necessary during both record and playback. Consider the situation where head 1 has just started to scan the tape in the record mode, writing PCM audio data on to the tape. At this time head 2 is recording the bottom sixth of the picture on the tape in the form of an f.m. carrier with down-converted chroma. The PCM audio and Y + C video signals must therefore be switched between heads in an accurately-

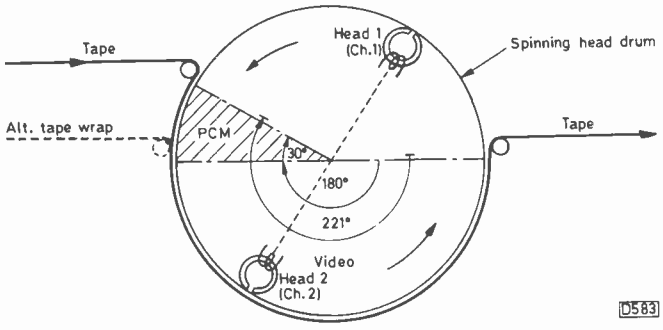

Fig. 6: Tape wrap and head scanning. The usual 180° of head scan is used for video recording: a "pre-scan" section is available to accommodate PCM audio signal recording.

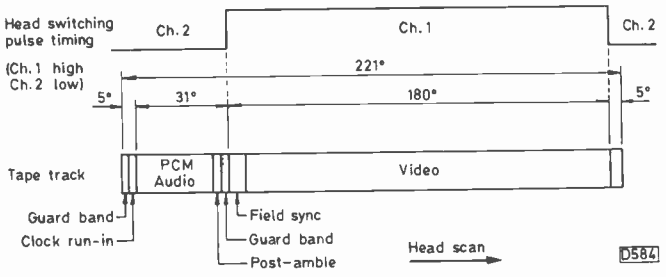

Fig. 7: Composition of a single recorded track on the tape.

timed sequence controlled by the head-drum PG pulses.

Camcorders and portable decks do not as yet use PCM audio – they use an alternative audio f.m. (AFM) system to be described later. Even so, all machines except the record-only Handycam (Model CCD-M8E and derived models, with 180° wrap) have the full 221° tape wrap, though only the deck machines use it all at present. Machines that employ AFM don't require head switching in the record mode: the PCM segment will thus become full of duplicated Y + C signals from the bottom of the previous field. Conventional playback on/off head switching prevents any problem arising from this. The wrap angle and tape/head relationship are shown in Fig. 6.

Fig. 7 gives more detail of the helical track and shows the guard bands that separate the PCM and video information. The head scans the tape as depicted in the diagram from left to right. After about 3° it writes a clock run-in for the PCM audio data. During the next 26·3° of rotation, corresponding to a period of 45·6 TV lines, the head records PCM audio data. Next comes a short "post-amble", then a guard band followed by the head changeover point, nominally 6·5 lines before the end of the TV field. The video signal occupies the next 180° in the normal way.

The H-alignment (TV line correlation) between adjacent tracks is a simple one: 1H in the SP mode, 2H in the LP mode. This arises from the fact that the video heads have no offset around the drum: they are diametrically opposite at 180°. This simple line correlation pattern greatly simplifies Y and C signal processing in the trick modes, where the signal from a head whose path crosses several tracks is not badly disordered.

Frequency Spectrum

The video signal is recorded on the tape in the conventional form: baseband luminance frequency modulates a carrier wave which is fed to the recording heads. Prior to modulation the luminance signal is bandwidth limited and undergoes pre-emphasis and non-linear pre-emphasis. As

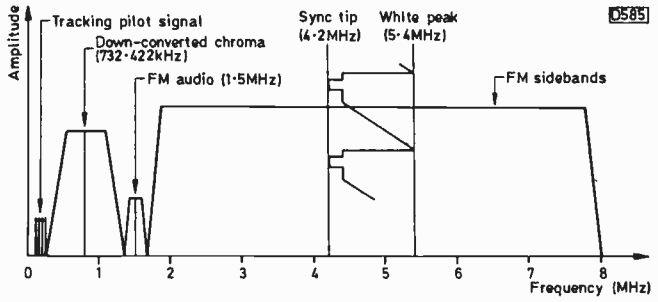

Fig. 8: Video 8 system signal frequency spectrum.

Fig. 8 shows, the carrier frequency is somewhat higher than normal, deviating between 4·2MHz (sync tip) and 5·4MHz (peak white). This upward shift of the f.m. carrier and its sidebands is facilitated by new head and tape manufacturing techniques, and leaves room at the bottom end, below the lower vision sideband, for the audio f.m. signal centred on 1·5MHz and with a bandwidth of 200kHz. The chroma signal is down-converted in the usual way and then added to the f.m. luminance signal which acts as an a.c. bias for the chroma. The chroma spectrum is centred on 732·422kHz, with a maximum bandwidth of just over 1MHz. This leaves room at the lowest end of the recorded frequency range for pilot tracking signals that are similar in frequency and purpose to the DTF (dynamic track following) signals used with the Philips V2000 format – indeed it was Philips who proposed the use of this technology with the Video 8 system. We shall be examining the operation of this part of the system in a later instalment.

On the Pill

Les Lawry-Johns

Yes, I'm on the pill and it hurts. Why? Because when you're taking Stemetil you have to knock off the booze. No whisky . . . it's murder! I must admit that I cheat a little, sort of forget to take the damned things and take my proper medicine instead. Why Stemetil? Because I tend to topple over when I'm sober, and that's not nice when you're carrying a TV set. The other effect is that my mind is muddled every now and again. This tends to get me into trouble with the customers who think I'm taking the mick because I look past them and forget what I'm saying. Never mind, I can't expect to be clever all the time. It's my heart you see: hasn't got the heart to pump enough stuff up into my brain, causing vertigo or something.

The Murphy V1400

This small monochrome portable was made in Japan. It was brought in suffering from a faulty tuner. This is of the rotary type and I didn't have one in stock. So I removed the top cover and inspected the interior. Movement of it either lost or restored reception so I checked here and there for dry-joints, noting that the voltages remained correct. I found that the spindle produced the greatest effect.

The spindle carries the tuning capacitor vanes, as with the tuner in the Thorn 1500 series chassis etc. So I attacked it by spraying the spindle clips to remove the grease, and made sure that the earth contacts were good. After this the tuner performed well and couldn't be made to play up at all. I just thought you'd like to know, because it's a repeat of an old story we all know so well.

Fidelity LOPTs

David Botto wrote recently (September) of having had no trouble with the line output transformer used in the Fidelity ZX3000 chassis. They've been a nightmare here. I've had dozens sparking over. When this happens various i.c.s are dealt a death blow. When the TDA2578 timebase generator chip is killed the symptom, after replacing the transformer, is no raster. This is because the field oscillator has died. Since the fault could also be due to the colour decoder chip a simple check is to apply 4·5V (approximately) to the top preset on the tube's base panel. This should reveal a single blue line if the TDA2578 is at fault. Having said this it will probably be the field output chip that fails next time. So far we've not had this i.c. fail.

This behaviour is in direct contrast to the earlier ZX2000 chassis, where the line output transformer's habit is to develop a short between windings with the result that the 10Ω h.t. smoothing resistor R828 goes open-circuit. This is usually the end of the story. If R828 holds out too long or a higher wattage resistor has been fitted (2W is correct) the chopper transistor TR13 (BUX84 or BUV46) could well fail. perhaps taking with it the 39Ω resistor R826 which is just inboard of it (rear left). This resistor, which is part of the damping network across the chopper choke, is essential to the correct working of the chopper transistor. I have spoken, and having spoken will now move on to something else.

The TX10

Do you recall the TX10 that had me by the short and curlies last month? I did do it in the end and feel thoroughly ashamed of myself. I'd removed the plugs in the order suggested in the manual, but the tripping had continued. I'd replaced the chopper transistor and its control chip, also the 121kΩ resistor (R813) that's so often talked about. The tripping had continued. So I sulked.

Some time later I thought I'd have another go and went through the same routine – plug removal etc. The tripping stopped when the scan coil plug was removed. This surprised me because it hadn't last time. So like a fool I hunted through the line output stage, checking this, that and the other and getting nowhere. Then a thought struck me. Before replacing the chopper I'd altered the setting of the h.t. control. I hurriedly set it up again and the tripping stopped. A nice picture with nice sound. It's the vertigo you know.

Remember Jason?

Nearly five years ago, in the June 1982 issue to be precise, I wrote about Jason the wonder dog and the Dynatron owned by Mr. Daines. Well Phil who pops in on Saturdays to pick up a few things (like TV sets) and to put me right now and again was sorting through some old copies of *Television* he'd not seen. He was reading the June 1982 issue and enjoyed the bit about Jason putting me right on the Dynatron. At this moment the phone rang. It was Mr. Daines. After five years his set had gone

wrong again. He'd moved (a bit nearer, as it happens) and is now resident at Park Avenue. I said I would call next morning (Sunday) to restore his field scan but it didn't at the time dawn on me that this was Jason's owner and that it was the same Dynatron. To be certain that it was a G11 I checked the model number (CTV55) with the list. It certainly was a G11, and I was quite happy. Then I realised who it was – and here was Phil sitting reading about the same set and dog.

Next morning I packed my gear and selected a spare timebase panel – without checking it closely. I sped out to Park Avenue and looked for the large house that lay back. Having found it I was most impressed. Mr. Daines came out to meet me and we went into this very nice house where we were greeted by Jason, his tail wagging and eager as ever to tell me what was wrong with the TV set. He led me over to it and barked when I turned it around.

I removed the rear cover and switched the set on. A white line appeared across the screen so I turned down the brightness. I checked the voltage at the upper left side (field timebase supply) to ensure that the fuse was intact. It was, and I could see that the TDA2600 field timebase chip's holder was feeling ill. To save time I removed the panel and fitted the one I had with me. The field scan was now full, but the picture was marred by patterning and was rolling. Jason barked because he could see it wasn't right. So I took the panel out and looked at it closely. At some time it had been subjected to rough handling and was cracked at the top and bottom corners where the holes are.

It seemed best to repair their panel by fitting a new i.c. holder. I searched through my boxes but couldn't find one. I'd not packed one because I'd thought a spare panel would do. Idiot. I'd done the wrong thing again. I should have repaired the cracks in the spare panel, but I didn't. I removed the holder instead and it shed its legs. I had to tell Mr. Daines I'd been a fool and that I'd have to go back to the shop to get the part required.

So I left things as they were and drove back to the shop, to be greeted by loud barks from Tessa and Zeb. They knew another dog had been around me. Only Spock was quiet. I selected the right holder and sped back. It was fitted in a thrice and the set received its own panel back. A good, clear picture was obtained. Jason wagged his tail and Mr. Daines wrote out his cheque.

Back at the shop Fred Cole was waiting with the G8 he'd bought from me some ten or eleven years earlier. The picture could hardly be seen so I reactivated the tube and adjusted the presets to get a good picture.

"Well done Lawry" said Fred. He always calls me Lawry. Lots of people do. They seem to think it's my Christian name. Never mind. We were now clear and could get washed and brushed and have a drink upstairs before dinner. I hadn't taken the pill. I'd forgotten again.

Micro Clinic

Reports from Nick Beer and Roger Burchett

Commodore 64

We've had several of these machines in with a defective 6510 chip. The symptom is a blank, black raster. Be patient after you've replaced the 6510. After switching on it can take up to five seconds before that black raster clears to give the Commodore prompt. You may switch on, see the black raster, switch off and think you've not cleared the fault.

Intermittent black streaks across the picture, which intermittently blanked out, was traced to the 8501 VIC chip. **N.B.**

Sinclair Spectrum

A blank, black raster – slightly snowy on two occasions – has been traced to a faulty 6C001E ULA chip.

A thin liquid had been tipped inside one of these machines that was brought to us – it had run considerably. The customer accepted a large estimate so I set about putting it right. First I replaced the usual faulty transistors (ZTX650 and ZTX213) in the 5V regulator circuit, also the coil. All the 4116 RAMs had internal short-circuits (shown up by the fact that they got very hot very quickly). After replacing these the machine still didn't initialise. The CPU, ULA and ROM chips were all found to be faulty.

Sinclair power supplies give a lot of trouble. Leads and plug problems are cured by replacing the whole lead – a five minute job and the leads cost less than a pound. Several of these machines have come in where the lead has gone short circuit and the diodes have caught fire, burnt the panel and the only economical answer has been a new unit – they are clearly not adequately protected.

Don't forget the thermal fuse on the primary of the transformer when servicing these! **N.B**

Commodore 1571 Disc Drive

A Commodore 1571 disc drive intermittently wouldn't read from the disc. The trouble was due to an intermittent lead between the computer and the drive unit. **N.B.**

Amstrad PCW8256

We are beginning to get PCW8256 word processors back with power supply faults. The raster produced is small and the STK7308 chopper control chip IC5001 screams. All is returned to normal when the i.c. is replaced.

Although sales of Amstrad machines have been good we've had few faults. One that does crop up from time to time is misadjusted heads on the cassette units, such as the CPC464. We suspect that these have all been "adjusted" by their owners. **R.B.**

Commodore 64

Hear tearing out time: a Commodore 64 wouldn't load from a 1530 (Taiwan made) data cassette. The head was slightly worn but fitting a new one made matters worse – now programs couldn't be found at all. Just to be perverse I fitted an old, worn head which had across it a groove that was plainly visible to the naked eye. We could now load some of the programs before they crashed! If you come across this apparently absurd reversal of what you'd normally expect look at R6 on the cassette. It should be 2·2MΩ but some were made with 220kΩ. I have to admit to some hours wasted and a bad night's sleep on this one. **R.B.**

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·50 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

THORN TX10 CHASSIS

When the fault first started to occur the picture would go dark to black when the set had been on for about an hour. Switching off and on restored normal operation. Now the picture goes black at switch on (starting off with colour) and has to be switched off for several minutes to restore the picture – this doesn't always work.

We've encountered this fault several times. In each case the culprit has been the green LED D657 on the c.r.t. base panel.

PHILIPS G11 CHASSIS

The set works well for about two hours, then bowed edges appear at the sides with part of the screen blank at each side. Switching off and on restores normal operation for another two hours.

The usual cause of this fault is a dry-joint in the EW correction circuit. Resoldering the connections to coils L3134 and L3137 on the line scan panel will almost certainly provide a cure.

TANDBERG CTV2 CHASSIS

The surge limiter resistor R981 keeps burning out. The chopper transformer and transistor have both been replaced – the former was open-circuit and the latter short-circuit. The trigger thyristor has also been replaced, using a BR103 as we didn't have a BRY55. The set starts up, with sound and a picture, then R981 overheats and burns out.

Since the set starts up and runs it seems unlikely that there's anything much wrong with the power supply. One possibility is that the crowbar thyristor (on the secondary side of the chopper transformer) is coming on. If the picture widens momentarily before the set fails, this will be the case. In this event check C981 by substitution then the regulator part of the chopper circuit, especially zener diodes D975 and D988. If the crowbar isn't operating and R981 is adequately rated, suspect the mains bridge rectifier's reservoir capacitor C977 (400μF).

ITT CVC20 CHASSIS

The initial fault with this set was reduced height. Replacing the field driver and output transistors T8/9/10 cured this. There's a fair amount of pincushion distortion however and the pincushion correction potentiometer R901 has no effect. In addition the raster is displaced a little to the north of centre and the screen can be filled only when the vertical linearity potentiometer R44 is at one end of its travel.

We've on several occasions encountered a similar set of symptoms and have almost always traced the cause of the problem to one of the electrolytic capacitors in the field timebase. The simplest, and not expensive, procedure is to replace the lot – C19, 20, 21, 23, 24, 26, 27, 28, 29 and 31. First however check R62, 63 and 65 with an ohmmeter.

PANASONIC NV430

The picture produced by this machine wanders horizontally and the music sounds awful. This is so with either prerecorded tapes or the machine's own recordings.

First check the setting of the capstan servo. Inability to set this up correctly could be due to a faulty capstan motor – but check that the control track head is clean and producing adequate pulse height. If the capstan servo is running correctly the fault could be due to a vibrating exit tape guide or even a mechanical resonance in the audio/control head assembly.

HITACHI CNP192

The picture is slightly to the right of its correct position but there does not seem to be a shift control in this set.

Sideways displacement of the raster can result from incorrect setting of the line hold and purity adjustments. Setting-up procedures are given in the manual.

FERGUSON 3V31

The problem with this machine is sound flutter. The tape path has been cleaned but this made no difference. The picture itself remains o.k. while the sound flutter is present.

The problem is not uncommon with this and similar decks and is generally caused by intermittent contact between the tape and the sound head. It can usually be cured by giving the top (audio section) of the audio/control track head a slight lean-out inclination. A very slight adjustment of the head mounting screws is required. Be careful not to upset the head height or azimuth settings.

ITT CVC20 CHASSIS

The problem with this set is no colour. There's a good monochrome picture.

A common cause of no colour with this chassis is dry-joints in the middle of the decoder panel, where earth lands are grounded by tabs on the internal screening walls. If these joints are intact, override the colour killer by linking TP507 to the 12V rail. If this produces a rainbow of colour bars, try setting up the reference oscillator frequency (trimmer C534). If it can't be adjusted for correct colours suspect the crystal and the TBA540 chip (IC502). Check the TCA800 chip (IC503) if overriding the colour killer fails to produce colour on the screen. Oscilloscope checks will be required if it's necessary to delve further.

THORN 9600 CHASSIS

Turning the set on from cold produces sound and a picture for about twenty seconds. The set then dies. After resetting, the length of time the set stays on decreases. The h.t. supplies from the chopper die when the fault occurs, but the voltage across the mains rectifier's reservoir capacitor remains constant at 320V. We have isolated the problem to the power supply panel but because of the fault condition it's difficult to make checks. There are no dry-joints, broken tracks or open-/short-circuits and the chopper control panel has been replaced.

Most such faults on this chassis stem from dry-joints under the timebase panel. If there are none here suspect loss of chopper drive, betrayed by a steady voltage of

about 340V at the collector of the chopper transistor VT512. In this case check for 13V at PL513-2: this is the supply to the chopper control panel, derived from the emitter of the chopper driver transistor. If it's low or absent check the regulator transistor VT513 and zener diodes W529/530. If it's present, suspect transistors VT601/2/3 on the chopper control panel.

TEST CASE

292

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

Once upon a time channel selection in a TV set was by means of a rotary tuning capacitor gang. Then came varicap tuners, initially with a simple, switched potentiometer bank for station selection. These were crude systems by today's standards, but you knew where you were with them. In the latest sets all sorts of elaborate and involved systems are used to produce a tuning voltage. Some of these are rather difficult to justify when you consider that a TV set or a VCR is often tuned once during installation and never thereafter altered.

What's brought all this on? A tussle with a Tatung, that's what. It was a Model DT1253, a 20in. set using the 120 series chassis and a relatively simple channel-change system with eight light-touch buttons. Channel selection is accomplished by a single chip, IM01 (SN76705AN), which is basically a counter-and-switch device. The problem with the set was its exasperating tendency to change channels at random. Each time the channel jumping occurred the channel indicator changed accordingly and the new channel was perfectly tuned. It was not any sort of drift problem therefore.

Although the type of light-action button pad fitted in this set suffers from contamination far less than the "open", i.e. finger-bridged, touch-pad type, our first move was to disconnect it altogether and select channel three with a shorting link. This would indicate whether leakage in the switches was responsible. It wasn't – within a couple of hours we were watching BBC-1 again! Must be the chip then. A new SN76705AN was obtained and fitted: the set was then reassembled in the confident knowledge that the problem had been cured. Had it? Had it hell!

With the BBC-2 test music ringing in our ears, above the general din of the workshop, we got out the circuit description for the 5-0979-5 touch-tuning panel. The main chip pin concerned with channel changing is pin 8, the "clocking" pin. So we replaced the components associated with this pin, RM03 (330kΩ), CM02 (220pF), RM01 (33kΩ), RM04 (270kΩ) and DM01 (1N4148) – we don't do things by halves! Spirits brightened as the set ran for the rest of the day firmly latched to Channel Four.

Next morning the set came up on channel one (BBC-1) at switch on, as it should. So channel no. four was selected for a test run. To our chagrin, later that same morning we found that the set presented us with a blank, noisy raster – it had jumped to channel no. six! Intermittent connections or dry-joints seemed to be an unlikely cause as the chip is designed to reset to channel no. one after an interruption. How about noise and interference on the chip's supply line? As a test, the chip and its peripheral components were powered from a separate 12V battery.

When we reapplied the mains power something happened that provided the answer to the whole problem. We pondered as we dismantled the battery connections and warmed up the soldering iron before changing the faulty component: with a bit more peace and quiet in the workshop, or a bit more information from the customer, we'd have got there much sooner. Bright sparks amongst you won't need to wait till next month for the solution.

ANSWER TO TEST CASE 291
— page 342 last month —

The business of the Sony camcorder last month showed the Service Department in its true colours! Heroically, and with the expenditure of much valuable time, the camera/encoder section of the CCD-V8AF had been set up for perfect reproduction of a colour-bar chart. What a pity we didn't have Mr. X's floral test card so that we could compare it with the picture obtained from his cassette. They would have matched very well, played back in the workshop.

In fact the situation was summed up in nine words by the intrepid delivery man who'd come hotfoot from Mr. X's residence with the camcorder box still in his hands: "The bloody grey scale on his telly's all wrong". A bit too much blue in the low- and mid-ranges it seems, and no previous opportunity to do a before and after test. . . .

Careful adjustment of the low-light potentiometers on the c.r.t.'s baseboard put things to rights and satisfied Mr. X. Even then the two pictures didn't match exactly, if one was inclined to split hairs when comparing the hues. The side-by-side check described is a very severe test of a camera's performance, and is subject to many variables. If this saga teaches any lessons, it's that a chain is only as good as its weakest link, and that every link in the chain should be considered during fault diagnosis.

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AN610P	£1.80	BA1310F	£1.75	HA11701	£3.50	LA4160	£2.40	STK082G	£7.75	TA7203P	£1.90	UPC1171C	£1.50	2SC460	£0.35
AN612	£1.80	BA1320	£1.25	HA11703	£4.50	LA4170	£3.50	STK086	£9.50	TA7204P	£1.75	UPC1176C	£1.50	2SC461	£0.35
AN5033	£5.25	BA1330	£1.75	HA11704	£5.20	LA4182	£2.10	STK430	£5.80	TA7205AP	£1.00	UPC1177H	£1.75	2SC503Y	£0.70
AN5265	£3.20	BA1360	£1.80	HA11705	£6.95	LA4192	£1.95	STK431	£5.95	TA7207P	£1.75	UPC1181H	£1.60	2SC536	£0.35
AN5510	£2.75	BA5102A-	£2.75	HA11706	£4.75	LA4200	£1.50	STK433	£5.25	TA7208P	£1.75	UPC1182H	£1.10	2SC537	£0.35
AN5620X	£3.50	CX065B	£2.95	HA11710	£3.75	LA4201	£1.60	STK435	£5.50	TA7210P	£2.50	UPC1183H	£1.10	2SC710	£0.35
AN5701	£1.80	CX075B	£2.75	HA11711	£9.50	LA4220	£1.50	STK436	£5.25	TA7214P	£2.60	UPC1185H	£2.20	2SC732	£0.35
AN5722	£1.60	CX095C	£2.85	HA11713	£6.50	LA4230	£2.25	STK437	£6.50	TA7215P	£2.30	UPC1186H	£2.50	2SC733	£0.35
AN5730	£1.85	CX100D	£6.75	HA11714	£5.95	LA4250	£2.75	STK439	£5.95	TA7217AP	£1.60	UPC1187V	£0.90	2SC828	£0.30
AN5732	£1.85	CX101G	£7.75	HA11715	£6.25	LA4422	£1.60	STK441	£7.95	TA7220P	£2.50	UPC1215V	£1.75	2SC840	£1.50
AN5753	£1.95	CX130	£4.75	HA11716	£4.75	LA4430	£1.40	STK443	£7.95	TA7222AP	£1.30	UPC1223C	£1.35	2SC900	£0.35
AN6250	£2.30	CX136A	£7.50	HA11717	£5.75	LA4440	£2.50	STK457	£6.50	TA7223P	£2.30	UPC1225H	£2.20	2SC929D	£0.35
AN6310	£6.25	CX143A	£7.50	HA11718	£4.75	LA4445	£2.75	STK459	£6.75	TA7225P	£3.25	UPC1230H	£2.00	2SC930D	£0.35
AN6341N	£4.00	CX156	£4.25	HA11727	£9.50	LA4460	£1.80	STK461	£7.50	TA7226P	£3.20	UPC1263C	£2.50	2SC1034	£4.75
AN6344	£4.75	CX157	£3.75	HA11745	£9.00	LA4461	£1.80	STK463	£8.40	TA7227P	£2.20	UPC1277H	£2.50	2SC1061	£1.20
AN6350	£7.50	CX158	£4.50	HA11747	£9.50	LA4500	£2.60	STK465	£8.50	TA7229P	£3.25	UPC1278H	£2.75	2SC1096	£0.70
AN6356N	£3.85	CX160	£3.50	HA11747ANT	£9.50	LA4505	£2.80	STK501	£6.25	TA7230P	£1.95	UPC1287H	£2.75	2SC1364	£0.35
AN6360	£4.50	CX161A	£3.50	HA11749	£4.75	LA4507	£4.25	STK0025	£4.95	TA7232P	£2.95	UPC1350C	£1.20	2SC1815Y	£0.45
AN6362	£5.50	CX162	£3.95	HA11750	£5.00	LA4520	£2.50	STK0029	£4.75	TA7240AP	£2.95	UPC1353C	£1.95	2SC1875	£2.95
AN6363	£7.50	CX170	£6.75	HA11751NT	£8.50	LA5112	£1.85	STK0039	£4.75	TA7241AP	£2.95	UPC1356C	£2.00	2SC1942	£3.25
AN6387	£5.95	CX181	£8.75	HA11753NT	£8.50	LA6458D	£1.20	STK0040	£6.25	TA7270P	£2.75	UPC1363C	£2.20	2SC1957	£0.80
AN6610	£1.80	CX1124A	£2.75	HA11758NT	£8.50	LA7016	£2.75	STK0049	£6.50	TA7310P	£1.85	UPC1378H	£2.40	2SC1969	£1.75
AN6677	£6.30	CX1241	£1.75	HA11768	£4.50	LA7215	£2.75	STK0059	£7.00	TA7312P	£1.50	UPC1382C	£1.10	2SC2078	£0.95
AN6811	£1.60	HA1125	£1.75	HA11788	£4.50	LA7751	£4.75	STK0080	£7.75	TA7313AP	£1.50	UPC1384C	£2.85	2SC2166	£0.95
AN6873	£4.50	HA1137W	£1.75	HA11816NT	£6.50	LA7755	£3.20	STK2028	£7.50	TA7314P	£2.50	UPC1387C	£2.50	2SC2335	£1.50
AN6884	£2.75	HA1144	£4.25	HA11828NT	£9.50	LA7800	£1.95	STK2029	£5.75	TA7315AP	£2.35	UPC1391H	£1.50	2SC2577	£1.95
AN7105	£2.30	HA1151	£2.50	HA12001W	£6.50	LA7801	£2.95	STK2129	£6.75	TA7317P	£2.75	UPC1403CA	£5.75	2SC2578	£2.75
AN7110	£1.50	HA1156W	£1.20	HA12002	£2.95	LA7806	£2.75	STK2230	£6.50	TA7324P	£2.50	UPC1420CA	£6.50	2SC2579	£2.75
AN7111	£1.50	HA1167	£3.75	HA12017	£2.75	LA7808	£2.95	STK3042	£6.50	TA7325P	£1.00	UPC1458C	£0.95	2SC2580	£2.75
AN7114E	£1.75	HA1196	£1.75	HA12035	£9.50	LB1287	£2.75	STK4060	£6.50	TA7328AP	£2.20	UPC1533HA	£2.75	TDA1515	£4.50
AN7115E	£1.60	HA1198	£1.75	HA12038	£6.75	LB1405	£2.20	STK4141II	£7.50	TA7331P	£2.20	UPC4557C	£1.50	TDA2002	£0.80
AN7116	£1.50	HA1199	£1.85	HA12413	£2.75	LC4066B	£2.95	STK4191II	£8.95	TA7343P	£2.95	UPC4558C	£0.90	TDA2003	£0.90
AN7120	£1.50	HA1306W	£1.80	HA13001	£2.95	LC7120	£3.50	STK4332	£5.75	TA7607AP	£2.95	UPD1514C	£5.75	TDA2004	£2.20
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				HA13430A	£4.50	LC7136	£2.75	STK5421	£6.50	TA7611AP	£3.20	X00777GE	£9.95	TDA2020	£1.40
						LC7137	£2.75	STK5422	£6.75	TA7614AP	£2.75	X0092CE	£5.60	TDA2030	£1.40
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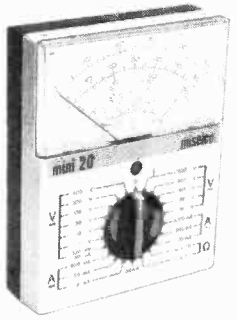

28 ranges
20kΩ/V d.c. & 4kΩ/V a.c.
(With protective fuse)

Accuracy: 2% d.c. and resistance, 3% a.c.

28 ranges: d.c. V; 100mV, 3V, 10V, 30V, 100V, 300V, 600V. **d.c. I;** 50µA, 600µA, 6mA, 60mA, 600mA. **a.c. V;** 15V, 50V, 150V, 500V, 1500V. **a.c. I;** 30mA, 300mA, 3.0A. Ohms; 0-2kΩ, 0-2MΩ dB; from −10 to +62 in 6 ranges.

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AC AND DC

★ **39 RANGES**

★ **INDESTRUCTIBLE**
(automatically protected on all ranges but 10A)

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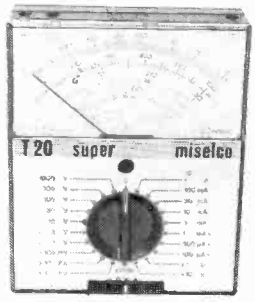

Accuracy: d.c. ranges and Ω 2% a.c. 3% (of f.s.d.)
39 ranges: **d.c. V;** 100mV, 1·0V, 3·0V, 10V, 30V, 100V, 300V, 1000V.
d.c. I; 50µA, 100µA, 300µA, 1.0mA, 3mA, 10mA, 30mA, 100mA, 1A, 10A
a.c. V; 10V, 30V, 100V, 300V, 1000V;
a.c. I; 3mA, 10mA, 30mA, 100mA, 1.0A, 10A.
Ω; 0-5.0kΩ, 0-50kΩ, 0-500kΩ, 5MΩ, 50MΩ
dB; from −10 to +61 in 5 ranges.
Dimensions: 105 × 130 × 40mm.
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AA117	9p	BC337	6p	BF184	20p	BFY57	25p	TIP32A	24p	2N.1131	28p	BY296	20p	7818	35p	PCL805	55p	LA-4461	180p	TBA560	100p	74LS22	17p
AA119	9p	BC338	6p	BF185	20p	BFY64	25p	TIP32C	28p	2N.1132	28p	BY298	25p	7824	35p	PFL200	85p	LA-5112	120p	TBA750	100p	74LS24	38p
AAY32	9p	BC557	6p	BF194	5p	BFY90	45p	TIP33	50p	2N.1613	24p	BY299	28p	7905	35p	PL36	80p	LM301	26p	TBA800	35p	74LS26	17p
AC107	28p	BCY32	150p	BF195	5p	BLY48	85p	TIP34	50p	2N.1711	24p	BY476	90p	7912	40p	PL82	45p	LM311	35p	TBA810S	75p	74LS27	17p
AC126	17p	BCY33	150p	BF196	6p	BLY49	85p	TIP41A	22p	2N.2102	50p	BYX10	15p	7915	40p	PL83	32p	LM324	35p	TBA820	75p	74LS28	17p
AC127	15p	BCY34	150p	BF197	7p	BR100	14p	TIP41C	25p	2N.2160	300p	BYX55/350	30p	7918	40p	PL84	50p	LM325	45p	TBA920	100p	74LS30	17p
AC128	15p	BCY42	20p	BF198	7p	BR101	43p	TIP42A	22p	2N.2218A	24p	BYX55/600	30p	7924	40p	PL95	140p	LM339	40p	TBA950	100p	74LS32	17p
AC128K	23p	BCY56	16p	BF199	6p	BR103	37p	TIP42C	25p	2N.2219	24p	BYX55/800	32p	78L05	28p	PL500	110p	LM348	80p	TBA990	100p	74LS33	17p
AC141K	30p	BCY70	16p	BF200	16p	BSX20	15p	TIP47	40p	2N.2221	23p	BYX70/300	29p	78L12	28p	PL504	95p	LM380	80p	TCA270	40p	74LS37	17p
AC142K	30p	BCY71	16p	BF240	16p	BSX26	18p	TIP48	40p	2N.2222	23p	BYX70/500	32p	78L15	28p	PL508	170p	LM381	150p	TCA800	200p	74LS38	17p
AC153K	23p	BCY72	16p	BF241	10p	BSX29	19p	TIP50	60p	2N.2369	15p	BYX70/800	36p	78L18	28p	PL519	450p	LM382	130p	TCA940	100p	74LS40	17p
AC176	18p	BD115	28p	BF255	12p	BT106	90p	TIP51	120p	2N.2484	20p	BYX71/600	80p	78L24	28p	PY81	70p	LM387	100p	TDA1170	100p	74LS42	39p
AC176K	20p	BD124P	50p	BF256	18p	BT109	90p	TIP52	120p	2N.2646	40p	OA47	6p	79L05	40p	PY88	48p	LM709DIL	30p	TDA1412	60p	74LS47	70p
AC187	15p	BD124	110p	BF257	18p	BT116	80p	TIP53	120p	2N.2904	20p	OA90	4p	79L12	45p	PY500A	160p	LM723	40p	TDA2002	80p	74LS48	60p
AC187K	20p	BD128	35p	BF258	18p	BT119	100p	TIP54	140p	2N.2905	20p	OA91	4p	79L15	48p	**LINEAR IC'S**		LM741DIL	18p	TDA2020	140p	74LS51	17p
AC188	17p	BD131	25p	BF259	18p	BT120	100p	TIP105	85p	2N.2906	18p	OA200	7p	LM309K	180p	AN-214P	200p	LM741 MET	45p	TDA2030	140p	74LS54	17p
AC188K	23p	BD132	25p	BF262	25p	BU100A	110p	TIP106	85p	2N.2907	18p	OA202	7p	LM317K	220p	AN-240P	150p	LM747	58p	TDA2522	90p	74LS55	17p
ACY18	48p	BD135	20p	BF263	25p	BU104	100p	TIP107	85p	2N.2926	8p	IN.914	2p	LM317T	180p	AN-360	120p	LM748	35p	TDA2530	100p	74LS73	28p
ACY19	48p	BD136	20p	BF270	18p	BU105	80p	TIP110	47p	2N.3019	28p	IN.4001	4p	LM323K	420p	AN-7110	140p	LM1458	33p	TDA2532	100p	74LS74	26p
AD142	60p	BD137	20p	BF273	15p	BU108	100p	TIP111	50p	2N.3053	18p	IN.4002	4p	LM723	32p	AN-7114	180p	LM3900	30p	TDA2540	100p	74LS75	32p
AD149	45p	BD138	20p	BF311	21p	BU110	110p	TIP112	40p	2N.3054	35p	IN.4003	4p	78HGKC	570p	AN-7115	180p	LM3900	30p	TDA2560	100p	74LS76	28p
AD161	22p	BD139	20p	BF324	25p	BU111	140p	TIP115	45p	2N.3055	35p	IN.4004	4p	78HO5KC	520p	AN-7120	140p	M-51513L	180p	TDA2593	100p	74LS78	34p
AD162	22p	BD140	20p	BF336	20p	BU124	60p	TIP116	45p	2N.3055H	60p	IN.4005	4p	78GU1C	190p	AY3-1270	680p	M-51515BL	270p	TDA2690	100p	74LS83	46p
AF124	25p	BD144	90p	BF337	20p	BU126	70p	TIP117	50p	2N.3440	58p	IN.4006	4p	79GU1C	215p	AY3-1350	300p	M-51517L	280p	UPC-555H	60p	74LS85	50p
AF125	25p	BD150	30p	BF338	20p	BU204	75p	TIP120	43p	2N.3442	85p	IN.4007	5p	79HGKC	670p	AY3-8910	380p	MB3712	150p	UPC-556H	80p	74LS86	30p
AF126	25p	BD157	38p	BF355	28p	BU205	70p	TIP121	46p	2N.3702	9p	IN.4148	2p	**VALVES**		AY3-8912	400p	MB3730	260p	UPC-575C2	100p	74LS90	39p
AF127	25p	BD158	38p	BF362	30p	BU208	75p	TIP122	47p	2N.3703	9p	IN.5400	9p	DAF96	60p	AY5-3600	570p	MB3756	260p	UPC-577H	64p	74LS91	75p
AF139	22p	BD166	30p	BF367	13p	BU208A	80p	TIP125	47p	2N.3704	9p	IN.5401	10p	DF96	50p	CA270	40p	MC1327	70p	UPC-592H2	95p	74LS92	46p
AF239	22p	BD175	30p	BF371	17p	BU208D	100p	TIP126	56p	2N.3705	9p	IN.5402	10p	DL92	47p	CA3046	60p	NE555	20p	UPC-1001H	220p	74LS93	40p
AL112	70p	BD177	30p	BF414	18p	BU325	55p	TIP127	58p	2N.3706	9p	IN.5403	11p	DY86	50p	CA3048	190p	NE556	40p	UPC-1025H	230p	74LS95	52p
AL113	80p	BD179	32p	BF420	16p	BU326	55p	TIP141	90p	2N.3707	9p	IN.5404	11p	DY87	50p	CA3060	280p	SAS560	110p	UPC-1026C	105p	74LS96	63p
ASZ15	100p	BD181	45p	BF421	18p	BU406	85p	TIP142	90p	2N.3708	9p	IN.5405	12p	DY802	45p	CA3080E	70p	SAS570	110p	UPC-1028H	90p	74LS107	35p
ASZ17	100p	BD182	80p	BF422	21p	BU406D	95p	TIP145	65p	2N.3771	85p	IN.5406	13p	EABC80	50p	CA3086	55p	SN76003N	140p	UPC-1031H2		74LS109	36p
AU110	110p	BD183	60p	BF423	15p	BU407	75p	TIP146	90p	2N.3772	90p	IN.5407	13p	EB91	44p	CA3089E	150p	SN76013N	140p		180p	74LS112	38p
AY102	180p	BD187	30p	BF440	16p	BU407D	95p	TIP147	100p	2N.3773	100p	IN.5408	13p	EBF80	45p	CA3089AQ	300p	SN76023N	140p	UPC-1032H	70p	74LS113	32p
AY106	180p	BD201	33p	BF451	17p	BU408	85p	TIP2955	42p	2N.3819	29p	**ZENERS**		EBF89	50p	CA3130E	90p	SN76033N	150p	UPC-1155	200p	74LS114	38p
BA145	10p	BD202	38p	BF455	14p	BU408D	95p	TIP3054	45p	2N.3866	68p	400MV		ECC82	40p	CA3130S	100p	SN76110N	70p	UPC-1156H	140p	74LS122	44p
BA148	10p	BD203	42p	BF458	19p	BU409	95p	TIP3055	42p	2N.3903	11p	BYZ88 Range		ECC83	43p	CA3140E	38p	SN76115	70p	UPC-1181H	115p	74LS123	50p
BA154	6p	BD204	42p	BF459	19p	BU426	120p	TIS43	45p	2N.3904	11p	2V7 to 39V	6p	ECC84	40p	CA3189E	250p	T2800D	52p	UPC-1182H	150p	74LS124	85p
BA157	12p	BD222	31p	BF461	60p	BU500	110p	TIS44	40p	2N.3905	11p	1.3W Zeners		ECC85	40p	CA3240E	90p	TA-7120	55p	UPC-1185H2		74LS125	38p
BB101	13p	BD225	31p	BF462	62p	BU526	80p	TIS61	15p	2N.3906	11p	BZX61 Range		ECH81	49p	HA-1156W	110p	TA-7137P	83p		250p	74LS126	42p
BB103	16p	BD232	31p	BF469	30p	BU801	95p	TIS88A	45p	2N.4031	25p	2V7 to 39V	12p	ECH84	52p	HA-1197	150p	TA-7146P	400p	UPC-1350C	150p	74LS132	44p
BB105B	18p	BD234	32p	BF470	28p	BU806	120p	TIS90	15p	2N.4036	25p	**JAPANESE**		ECL80	57p	HA-1306W	170p	TA-7193P	400p			74LS133	34p
BB205B	24p	BD235	28p	BF471	28p	BU807	95p	TIS91	18p	2N.4037	25p	**TRANSISTORS**		ECL82	59p	HA-1319	250p	TA-7200	200p	**74LS SERIES**		74LS136	35p
BC107	7p	BD236	30p	BF479	30p	C106D	23p	TIS93	20p	2N.4058	13p	2SB324	55p	ECL84	57p	HA-1339	170p	TA-7201	200p	74LS00	17p	74LS138	38p
BC108	7p	BD237	21p	BF493	18p			VK1010	88p	2N.4443	76p	2SB507	68p	ECL85	57p	HA-1342	170p	TA-7203	180p	74LS01	17p	74LS139	40p
BC109	7p	BD238	24p	BF494	18p	MJ2500	100p	VN.10KM	60p	2N.4444	76p	2SB754	80p	ECL86	49p	HA-1366WR		TA-7204	110p	74LS02	17p	74LS145	83p
BC115	10p	BD244	50p	BF595	18p	MJ2501	110p	VN.46AF	88p	2N.5061	20p	2SC495	60p	EF80	31p		160p	TA-7205	80p	74LS03	17p	74LS147	120p
BC118	11p	BD245	50p	BF596	18p	MJ2955	55p	VN.66AF	100p	2N.5294	30p	2SC1060	99p	EF85	34p	HA-1368	160p	TA-7210	200p	74LS04	17p	74LS148	110p
BC140	19p	BD433	28p	BF597	10p	MJ3000	115p	VN.88AF	115p	2N.5296	30p	2SC1061	200p	EF89	43p	HA-1377	220p	TA-72222AP		74LS05	17p	74LS151	38p
BC141	19p	BD434	30p	BF615	30p	MJ3001	115p	VN.89AF	110p	2N.6106	40p	2SC1096	78p	EF183	45p	HA-1389	140p		120p	74LS08	17p	74LS153	42p
BC142	19p	BD435	31p	BF758	41p	MJE29A	30p			2N.6107	40p	2SC1161	110p	EF184	53p	HA-1392	230p	TA-7310P	100p	74LS09	17p	74LS154	100p
BC143	19p	BD437	28p	BF869	22p	MJE30A	30p	ZTX107	11p	2N.6109	40p	2SC1172	150p	EL34	190p	HA-1397	250p	TA-7609	270p	74LS10	17p	74LS155	51p
BC147	8p	BD438	38p	BF870	22p	MJE340	25p	ZTX108	11p	3N.128	85p	2SC1306	90p	EL36	60p	HA-1398	240p	TAA550	16p	74S11	17p	74LS156	49p
BC148	8p	BD439	40p	BF872	23p	MJE350	80p	ZTX109	12p	3N.143	65p	2SC1307	100p	EL84	50p	LA-1201	85p	TBA120S	45p	74S12	17p	74LS157	35p
BC149	6p	BD440	40p	BF960	38p	MJE520	30p	ZTX212	27p			2SC1678	120p	EL95	50p	LA-1352	120p	TBA395	80p	74S13	26p	74LS158	47p
BC157	6p	BD441	40p	BF963	40p	MJE2955K	90p	ZTX300	13p	**DIODES**		2SC1969	130p	EL500	50p	LA-1365	140p	TBA396	80p	74S14	30p	74LS160	52p
BC159	6p	BD442	40p	BF964	38p			ZTX301	16p	AA119	9p	2SC2028	75p	EL504	100p	LA-3301	120p	TBA520	100p	74S15	17p	74LS161	56p
BC182	6p	BD533	50p	BF966	40p	OC28	100p	ZTX302	16p	BY100	40p	2SC2029	120p	EY86	31p	LA-3350	120p	TBA530	100p	74LS20	17p	74LS162	50p
BC182L	6p	BD534	38p	BFR40	25p	OC29	80p	ZTX303	24p	BY103	32p	2SC2078	120p	EY87	31p	LA-3361	115p	TBA540	100p	74LS21	17p	74LS163	50p
BC183	6p	BD535	38p	BFR51	21p	OC35	100p	ZTX304	17p	BY126	6p			EY88	42p	LA-4030	200p						
BC183L	6p	BD536	38p	BFR62	21p	OC36	120p	ZTX320	29p	BY127	8p	**LOW PROFILE**		EZ35	45p	LA-4031	140p						
BC184	6p	BD537	40p	BFR79	25p	OC45	60p	ZTX326	29p	BY133	8p	**SOCKETS**		EZ80	60p	LA-4032	140p						
BC184L	6p	BD538	40p	BFR90	52p	OC71	30p	ZTX500	13p	BY164	40p	8pin	6p	EZ81	85p	LA-4050	130p						
BC212	6p	BD675	40p	BFR91	99p	OC72	50p	ZTX501	13p	BY176	85p	14pin	8p	GZ34	180p	LA-4051	160p						
BC212L	6p	BD676	40p	BFX29	20p	OC200	180p	ZTX502	18p	BY179	35p	16pin	9p	PC97	100p	LA-4100	120p						
BC213	6p	BD677	38p	BFX84	20p	R2008B	100p	ZTX503	18p	BY182	32p	18pin	12p	PCC85	42p	LA-4101	100p						
BC213L	6p	BD678	40p	BFX85	20p	R2010B	100p	ZTX504	25p	BY184	32p	20pin	14p	PCF80	58p	LA-4102SK	140p						
BC214	6p	BD679	40p	BFX87	18p			ZTX550	24p	BY187	32p	22pIn	16p	PCF200	135p	LA-4112	280p						
BC214L	6p	BD680	40p	BFX88	15p	TAG4443	78p			BY196	20p	24pin	18p	PCF801	110p	LA-4125	210p						
BC237	7p	BD681	45p	BFX89	60p	TAG4444	78p	2N.696	28p	BY206	11p	28pin	20p	PCF802	87p	LA-4140	70p						
BC238	7p	BD682	45p	BFY17	30p	TIP29	15p	2N.697	22p	BY207	11p	40pin	25p	PCF806	115p	LA-4201	120p						
BC300	16p	BDX32	100p	BFY18	40p	TIP29A	22p	2N.698	40p	BY208	18p			PCH200	100p	LA-4220	120p						
BC301	18p	BDX65	80p	BFY41	28p	TIP29C	25p	2N.699	45p	BY210	22p	**VOLTAGE**		PCL81	54p	LA-4400	190p						
BC302	18p	BDY92	100p	BFY50	14p	TIP30	25p	2N.706A	22p	BY223	72p	**REGULATORS**		PCL82	63p	LA-4420	140p						
BC303	18p	BF180	15p	BFY51	14p	TIP30C	30p	2N.708	22p	BY225	120p	7805	35p	PCL84	50p	LA-4422	130p						
BC327	6p	BF181	18p	BFY52	14p	TIP31A	24p	2N.914	28p	BY226	18p	7812	35p	PCL85	55p	LA-4430	130p						
BC328	6p	BF183	20p	BFY56	25p	TIP31C	30p	2N.918	38p	BY227	19p	7815	35p	PCL86	55p	LA-4460	170p						

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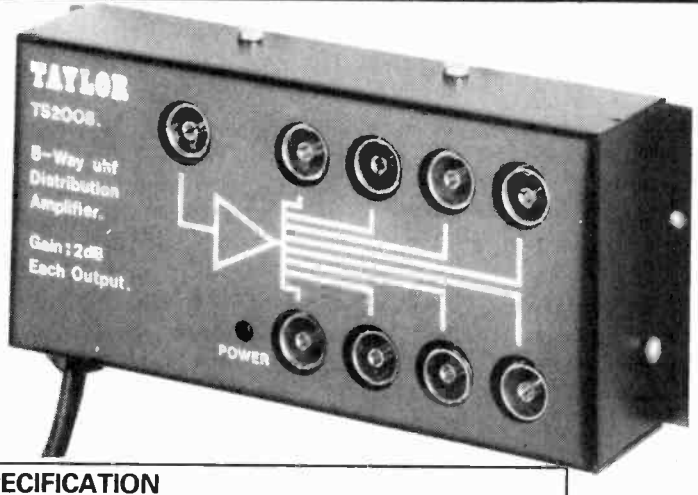

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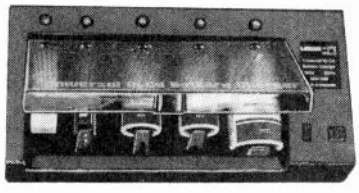

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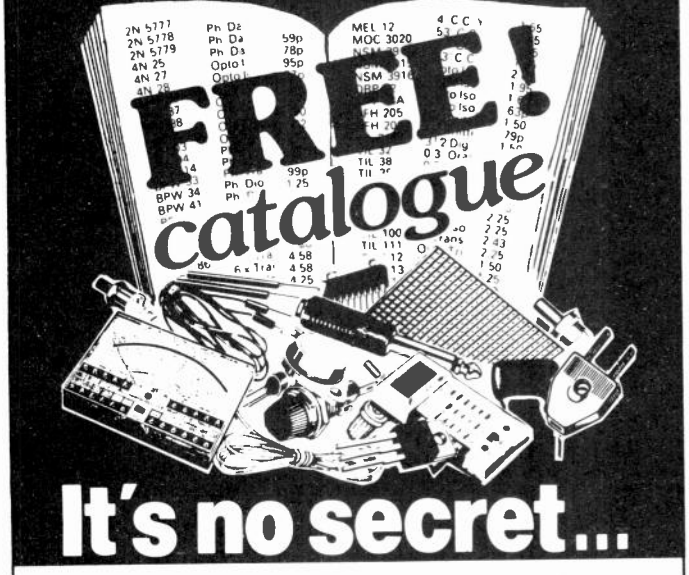

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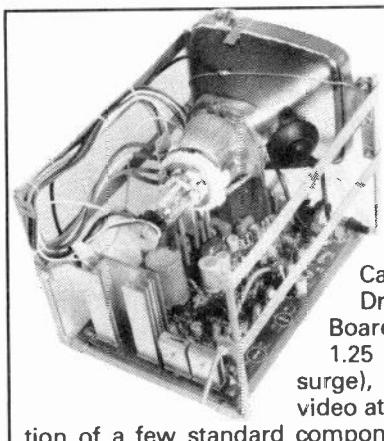

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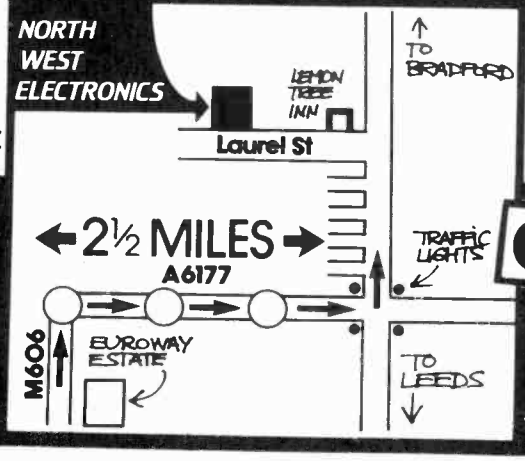

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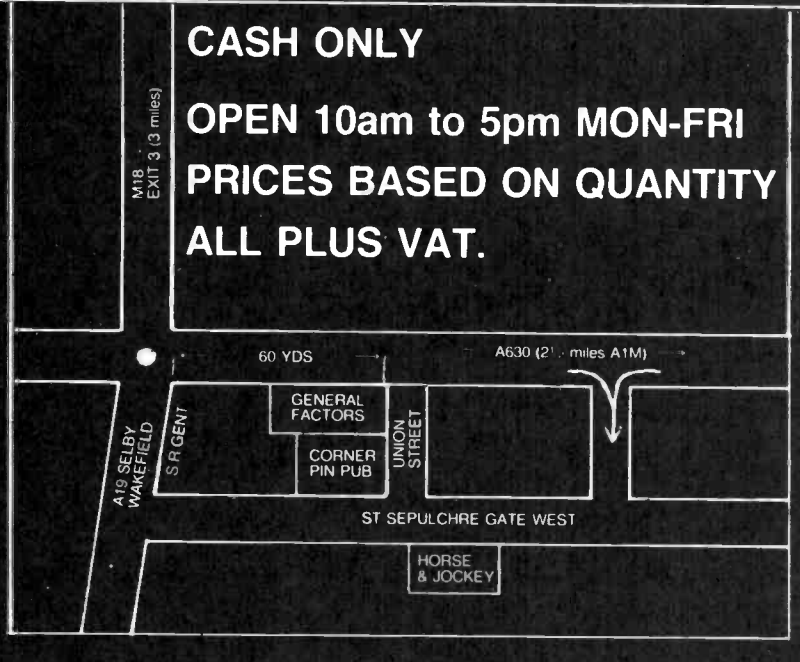

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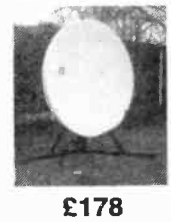

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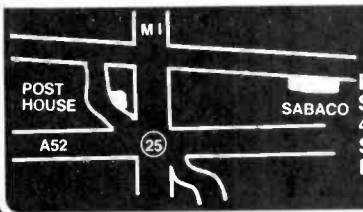

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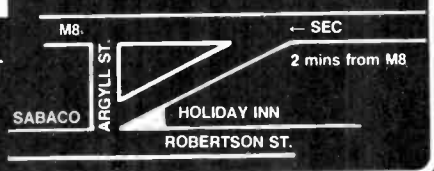

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Thorn Chassis U916D Complete £10

Thorn TX9 Remote Panels with I.C.s £2.50

Thorn 9000 4 Slider Front Panel £4

24V 4Amp (100VA) Trans £4.00

Mains 240V (100VA) to 240V out fully shrouded £5.00

ITT CVC45 8 way resistor unit for v/cap £3

CVC40 push button unit with mains lead & slider pots £10.00

8000/30v 50p
470/40v × 10 £1
22/100v × 10 £1
100/350v 70p
400/350v 70p
.47/500v 25p
1/600v 25p
.022/1kv 10p

NI.CD Charger MW398 6A.A £8
NI.CD 5 Hours Battery Charger £8

Nickel Cadmium Battery Charger AA-C-D-PP9 £6

12 Volt Aerial Changer over Relays 144 Mc/s 45 watts 50p

6 Push Button Unit for GEC 2100 Series Replacement for Touch Button Unit £8

8 SEG LED Display with driver I.C. LM1017 50p

CVC8-9 Push Button Unit £10

Electronic Buzzer 60p

15V, 015V, 1A £1
Print Type Trans

Philip's Headphones Compact Disc Stereo Type £13

ITT Display Tube 58705 50p

8 Seg Display FND500 20p

Model 3000 Pocket Personal D.M.M. Volts range AC. DC 200M/V to 400V. Res. 2000Km £24

Export PYE731 6 Push Button unit with (UHF-VHF) band switch £4

ITT Micro Phone M5 50p with switch

1½ Volt Sub Min Relays 25p

Philips Solar Scientific SBC1730 Calculator £12

15v-0-15v 1 Amp Transformers £1

RGP30K 10p
RGP30G 8p
RGP10B 5p
RGP15G 6p

Multi Core £4.50
60–40 Soldar 500G 20 SWG £5.00
15 Watt Stereo Amp Sanyo Module with Data 50p
25pcs Precision Screwdriver & Tool Set £6.00
25 Watt Solder Iron £4.00

Various Tools and Accessories
T/V V/Aerial 300Ω or 75Ω £1.50
L.C.D. clock display with alarm 75p
* D/P push mains switch 20p each
Mains lead & two pin socket for radio cassette 35p
T/V loop aerial 75p
Radio Telescopic Aerial £1.00
Philips Neon Lamps for TV sets 5p
Freeze Philips £1.20
Foam Cleaner Philips £1.20
Contact Cleaner Philips £1.20
Cans of Anti Static, Degrease Cleaner and Anti Corona All at £1.40
Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt £1.00
Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket £3.00
Screen locking agent, large can £1.50
Red E.H.T. LAED and Anode Cap £1.00
Weller solder iron 15 watt/25 watt £5.00
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V 60p
100 Coax Plugs £12.00
De-solder pump + 2 nozzels Philips £4.00
Flat Red LED and Green 5p
500gm 60/40 solder reel £6
Solder 1 kilo reel £5.50
Dual v/u meter -20 – +10db £1
K30 thermistor 232266298009 75p
De-solder Pump £2.50

Panel Meters VM/A
Gray front and .0-300V AC/DC 2¾ × 2¼ and IM/A £2.00 each

SONY 1400KV Chroma Panel £6
SONY 1400KV Touch button unit £3.50

GEC Decoder Panel PC772A3 PC446A5 £6

Tube Base 20AX GEC PC852B3 £1

Thorn Aerial Socket TX10 £1

12 Volt Mains Trans 500M/A £1.00
18V or 12 Volt Mains Trans 500M/A 75p

Quantity Reductions
BY204/4 25 for £1.00
BY206 25 for £1.00
W005 bridge 20 for £2
KT3 touch button black 6 for £1
G11 touch button red 6 for £1
K30 full remote Dawer Ass with 3 I.C. £7.00
K30 VHF. UHF Dawer Ass £6.00
BY298 3 amp/fast/R 20 for £1.50
BU126 10 for £6.00
BU205 10 for £8.00
BU105 10 for £6.00
BF458 10 for £1.00
BF224 20 for £1.40
OA90 40 for £1.00
50 Ceramic Condensers £1.50
Mixed Mounting Kit for Power Transistors 50p
300 Condensers £1.50
300 Resistors £1.50
150 Electrolytics £2.00
15 Bulbs Philips 40p
Antistatic Discloth 5 for £1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

Plastic Boxes 4¾ × 4 × 1 × ¾ 50p
100 Fuses £2.00
100 W/W Res. £1.50
BF 199 20 for £1
10 × 20 Turn 100k pots. Rank £2
BF 470 20 for £2
20 Slider Knobs 70p

6 Mixed UHF Aerial Isolating Sockets, some with long leads. Fit ITT, GEC, Philips, Pye £1.00

Mixed Packs
TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits £1.00
50 Mixed AC series Transistor £4.50
25 Panel Mount Bulbs & Neons £1.50
10A £1.50
25 LED red/yellow/green £1.50
20I/C Holders £1.20
20 Large LED Red £1.00
20 Small LED Red £1.00
10×20 Turn 100K Pots £1.00
100 Transistor £2.50
20 Convergence Pots 80p
10 Thermistors 50p
20 Slider Pots £1.00
30 Presets 50p
40 glass reed switch £1
10 press to make switch 70p
40 Pots £1.50
5 Tube Bases £1.00
1,000 Diodes, Condensers, Resistors on Bandolier £2.00
20 Knobs £1.00
20mm Fuse Holders Chassis Mount 20 for £1
1N4001/6 100 mixed £2.50
EHT Diodes, small 20 for £1

200 Mixed Diodes £1

100 500M/A Fuse £1
100 1.225 Amp Fuse £1
Mixed V/Cap Pots ITT-GEC-Hitachi-Philips etc. 20 for £1
ITT Mains Switch with Remont CMC113 £1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

Thorn Spares

New 9000 Decoder	£8.50
9000 Frame panel	£8
9000 Cyclops panel	£1.50
8000/8500 timebase panel	£8
8800 convergence panel	£6
8500 convergence panel	£6
4000 Power supply	£3
1600 Mains lead, switch	
3500 6 push button + cable form	£1.50
T605 1vNPN T066 80v/6A	10p
9000 Sound output panel	£1
3500 Focus unit	£1.50
3500 Mains Trans	£4
3500 cut outs	10 for £4
3500 IF panel	£2
3500 Frame panel	£3
3500 Line panel	£3
3500 A1 Diode	20p
Export 3500 IF panel	£2
IC board with set of SN74LS	£1
4000 Tube base	£4
3500 A1 pots	50p
Beam limiter panel	£1.50
3500 Power panel with Y969	£1
3 Way regulated adaptor 240V 6V/ 7.5/9V/300mA	£3.50
Rank/Toshiba preh unit 0354	£9.50
4 Push button unit preh	£1.00
6 Push button VHF/UHF for v/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
G8 Push Button Unit	£10.00
KT3 12 Push button unit	£2.00
KT3 (Export) 12 P.B.u	£2
6 Push button Unit Thorn	£1.00
6 Push button GRC	£6.00
6 Push button PYE 731	£6.00
Hearing aid unit	£3
Rank Z718 4 P/B/Unit MECH	£4
7 Button Unit GEC with Lamps	£7
697 Push Button Unit	£6.00
Z916B panel	£5.00
1513AP panel	£5.00

Mains Droppers

G8 2R2+68R	£1.25
G8 47R 15 watt	£1.00
Pye 731 3+56−27R	50p
Thorn 50/17/1K5	£1.00
120/20/20/48/117	£1.00
270/10/6 for Thorn 4000	50p
18/320/70/39	£1.10
Thorn 50-40R-1K5	50p
Ac Socket & Lead GEC, ITT, Philips, Pye	25p
7×3¾ Thorn	£1
Thorn 1600-1700	£1.50
Rank Toshiba Tube Bases	30p

Speakers

6×4 G11	25 ohm	£1.00
5½×2½	3 ohm	£1.00
5×3	80 ohm	70p
5×3	50 ohm	50p
5×3	35 ohm	70p
6×4	15 ohm	£1.00
6×4 speaker	16 ohm	
7×3	70 ohm	£1.00
8×5	8 ohm 15 watt	£2
8×5	8 ohm	£1
5×3	8 ohm	70p
7×3	16 ohm	£1.00
5" dia	16 ohm	£1.00
5" dia	8 ohm	£1.50
6½" dia	4 ohm	£1.50
6½" dia	3 ohm	£1.50
2¾" dia	8 ohm	75p
3" dia	8 ohm	75p
4½" sq.	15 ohm	75p
KT3 speaker	K30	75p
3" dia	15 ohm	60p
1600 5×3	12 ohm	£1
K45 Philip	15 ohm	75p
K30 15 watt		£1

KT3-K30

OE-425		
OE-550	I W	10p
OE-513	correction	10p
OE-557		50p

DIODES

BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 164	50p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600- 4 8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 228 1500v	20p
BY 299 Red	20p
BY 229/400	30p
BY 299/60p Tag	30p
BY 237	5p
BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 527	10p
BY 602	10p
F 247	10p
GP20G	5p
XK 3102	50p
BYV 28/200	20p
800v/2 75 amps	10p
International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
6A/1000V Stud Diodes	20p

K35 Decoder	£8.00
K35 Sound OP	£4.00
K35 Split Diode 3122-138-35930	£10.00
K35 IF	£5.00
Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00

Line Transformers

Thorn 1690 LOPT	£6.50
2 J/Pots 3,500 1 off each type	£3.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
1690 Thorn EHT over-wind with diode lead & anode cap	£2.50
GEC 2040	£3.00
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono 1704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3.00
Rank L.O.P.T Z970	£3.00
CVC20 ITT	£7.00
AT2080/15	£5.00
CVC30 ITT	£5.00
CVC32 Line Tran	£7.00
CVC800 Line Trans	£6.00
CVC40 Slip/Diode	£12.00
CVC 45	£5.00
GEC Portable G1OT2041	£3.00
GEC Portable G1OT2046	£3.00
EHT Split Diode Leads ITT	£1.00
3500 L.O.P.T. & ITT Trans each	£2.00
LOPT Rank Z763	£5.00
K35 Split Diode 3122/13835930	£10.00

Black Triplers

S.T.C. Universal Tripler	£5.00
11 TTT	£2.50
11 TGA	£2.00
ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
8500 Thorn	£4.00
9000 Thorn	£6.00
9500 Thorn	£4.50
9600 Thorn	£4.00
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
G8 Tripler	£5.00
Green Tripler with foacs pot	£6.00
CVC 825 ITT CVC 20/25/30/32	£3.50
Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBQ Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
ERO Tripler print type with foacs PO7 BG2087	£5
T/text ultrasonic rec'r panel	£14.00
12-14V 20 for £5.00 200 for £25.00	
GEC 8 touch unit assy complete with all I.C's + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
KT3 IF panel	£6.00
KT3 line OSC transformer	£1
KT3/K30 infra-red receiver head	£1
K30 drawer unit with IC's (home)	£10
K30 drawer unit with IC's (export)	£10
KT3 AE Sockets	50p
KT3 receiver panel	£8
KT3 line driver transformer	50p
Pye, K30, GEC, etc. Pre-mains stand-by switch	£1
Decca 80/100 IF panel	£5
NPN PNP 80V 6 Amp TO66 O.P. Trans	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B.U.	£24
G11 6 touch unit replacement with dat	£14.00
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans. & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10
CVC 20/25/30/35/40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE5IIN	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

TELETEX DECODER

I.C SAA 5051	K30	
I.C. SAA 5042		
I.C SAA 5030		
I.C SAA 5020 etc.		£8.00
BTW 92/800R		£3
25A473 PNP C/P		10p

Rank T20 Z136 Panel	£6
NEW 1617 THORN Chassis with ICs & AU113	£5.00
NEW GEC 20AX Power Supply Switch Mode	£12.00
Complete new GEC portable chassis M1201H/M1501H with P.B.U./ v.cap/LOPTI	£10
Field + Jungle panel for GEC 3133/3135	£1.50
GEC 2110 line panel with transformer	£7.00
GEC 2110 tuner unit + IF Panel	£12.00
Pye/Chelsea Line op panel	£12.00
Pye 205 T/unit	£3.90
Pye 205 Line op panel	£7.50
Pye 713 IF panel and tuner	£7.00
Pye 713 Chroma	£10.00
Pye/Chelsea Timebase panel with LOPTI	£10.00
Pye 731 Frame Panel	£5.00
Pye 731 Convergence Panel	£5.00
Pye 731 Chroma	£10.00
Pye 731 IF panel + tuner	£10.00
Pye CDA/205 panel	£6.00
GEC portable chassis + LOPTI 2114 New	£4.00
Thorn 1613/1713 chassis	9.75
G9 Power Panel	£6.00
Mono RANK Chassis 127A NEW	£10.00
NEW G9 Frame Panel	£4.00
NEW G11 IF Panel	£10.00

G8 Tuner Unit + Panel	£4.00
G8 Power Supply	£5.00
G8 6 Sloping PBU	£8.00
G8 IF & Chroma	£6.00
G8 Chroma	£3.00
G11 IF Detector	£3.00
G11 Selector gain module	£3
Complete CVC 825 Chassis (both panels)	£40.00
AEC V/Cap Resistor Unit UHF with IC	
SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz I I.C. SL437F	£3.00
Z909B RANK IF Panels Export 5.5MHz 2 I.C's TBA1205B TCA2705Q	£2.50
K35 IF	£6.00
Z743 RANK IF Panel Export 5.5MHz 3 I.C's TBA750+SC9504P+ SC9503P	£1.50
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead	£5.00
Pye 6 button switch portable	£1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export)	£12.00
GEC Line O/P PC 659B3	£6.00
2110 GEC Power Panel	£8.00
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots 8 and 12 button units	£9.00
CVC9 slider pots panel	50p
CVC 5 Mains on/off + 5 pots	£2
Universal Focus. Fits Pye, Thorn and Decca Units.	
T147 Rank tube base on panel	£1.00
Z718 Focus Unit	£1.50
T20 Focus Unit	£1.00
Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
K30 Tube base on panel	£1.00
TX10 Focus Units	£7.00
CVC 32 Focus Unit	75p
Fedility Focus Unit 14R−14S	30p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split	
Z718 Bush Focus	£2.00
Diode	50p
TV11	50p
Remo TV12SP	50p
1600 Thorn EHT Rec and Lead	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p

G11 drawer ASS 3 pots Mains switch and lead	£2.00
K30 Drawer Ass with pots cable forme	£1.00
Line O/P panel GEC 2217/2218/2213/ 2214/2226/2227/2228	£10

PHILIPS BATTERIES
(Small Types)

SR41	60p
SR43	60p
SR44	60p
SR54	60p
LR43	50p
LR44	50p
LR54	50p
CR2032	60p

.22/1000	20p
1/250AC	20p
.1/100	5p
1MFD-250AC	25p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
2000/100	70p
4700/100	75p
47/160	10p
300 300/300/300V	80p
800/160	50p
.1/250 Pulse	5p
2,2 250v	10p
3n3/250 A.C.	10p
.33/250V	20p
.39/250V	15p
4n7/250 tested 5KV	25p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
GEC600/250	60p
700/250	£1
300+300 MFD 350v	£1.00
800/250	40p
32/300	20p
4/350	5p
8/350	8p
4.7M/350v	10p
33/350	20p
220/350	30p
300/350	40p
400/350	50p
10/375	10p
22/375	15p
220/385 (ITT)	75p
330/385 CVC 820 ITT	60p
0.1/400	15p
KT3 E/W 39/400	15p
.56K/400v	20p
4700pf/400	10p
.22/400	10p
8/400	15p
33/400	20p
400/400	40p
394K/400V	20p
220/450	40p
47/500	25p
0 1/600	15p
0.1/1200V wire end	20p
0.1/450 A/C wire end	20p
.22/1000	20p
.047/600	15p
0.047/1000	10p
0.01/1000	10p
0.1/1000	10p
.47/1000v	65p
.47/250V A.C.	10p
.001K/1250	10p
0.0047/1500	10p
.005/1500	10p
.0105/1500	15p
1n8/1500	10p
2n0/1500	15p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	20p
0.1/2KV	15p
3n9/2KV	10p
0.0015/2KV	10p
6n2/2KV	15p
2n0/2KV	15p
2n2/2KV	15p
470pf 4KV	10p
7500pf/2KV	10p
3000PF/3000V	10p
4n7/2KV	15p
8n2/2KV	15p
0.0082/2500	10p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
47/100V	80p
CVC 20-25-30 Mains Switches	60p
Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720R)	£1.50
RANK & ITT Mains Remote Switch 2865 ohm	£1.50
RANK & ITT Remote Switch 2800 ohm	£1.50
G11 Mains Switch	50p
4 amp Mains Switch	25p
GEC Mains Switch 4 amp	30p
KT3 Mainswitch	£1.00
THORN Rotary Mains Switch	50p
G8 Mains Switch	75p
G11 Prch Red LED P/Button for C.H. Change	20p
RANK TOSHIBA Transductors TPC-2021	50p
Mains Switch ITT Long Type Print	75p
Mains Switch Philip Long Type TAG	75p
Mains Switch GEC Long Type TAG	75p
Thorn 12 or 24 volt battery convertor for portable colour T/V	£6.00
2000 Chassis Fidelity Mains Switch (4 TAG)	60p
250V/4A White Lorlin Mains Switch	60p
KT3-K30-K35 Full Remote Mains Switch (6 TAG)	£1

Tube Thermpath 167	£1.00
Rank Secam Decoder Panel UHF & VHF T115A	£13.00

Multi-Caps

220 MFD Sprague 385V	50p
350V 300M + 300M	£1.00
400V 400M	60p
350V 400M	60p
Thorn 3500	
175/100/100/350v	£1.00
KT3/200/25/25/385v	£1.00
200+200+75+25M 325V	£1.00
300+300+150+100+50MFD 350V	£2
G11 CAP 470/250	£2
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
150/200/200/300v	70p
300/100/100/16/275v	£1.50
100/200/325v	40p
150/150/100/375v	£1.50
200/200/75/25M 325V	£1
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
150/150/100/100/320v	£2.00
100/350 + 300/200/100/16/275v	£2.00
225+25/380 GEC	70p
200/100/100/350v	£1.50
500/500/25v	50p
150/150/100/300v	75p
200/150/150/300v	1.00
ITT 8 and 6 Push Button	£1.00
Pye 725 LOPTs	£6.00
Pye 731 LOPTs	£6.00
Thorn 8500-8800 LOPTs	£5.00
CMC 301	£20.00
CMC 303	£20.00
CMD 800 Chassis. No tuner	£20.00
CMD 800 Decoder	£8.00
CMD 800 IF/Tuner	£20.00
UPC 574	30p
BSS 38	30p
G11 I I.C. Receiver Panel	£1.50
3 I.C. Power Supply G11 Full Remote Receiver Panel	£3
FET Power VN88AF	50p
PHILIPS SBC 469 Stereo Microphone	£23.00
Meters Hills 520	£17.00
Meters Hills 420	£15.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MRG Rangers	£28

Infra Red Hanset Tester

Works at 24 feet – Sound repeater.
Works off 9 volt battery **£8.00**
Fits in top pocket.

Repaired Handsets

Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day **£10.00**

RC4001 Full Remote KT3 K30 Teletext Handsets exchanged **£9.00**

GEC Full Remote Infra-red 1983 models **£15.00**

Timers, 60 mins, small **£1.00**

TOSHIBA HAND SETS

24 Button CT938 Fulirem'cte	£5.00
32 Button CT983 Videotext	£6.00
G11 Touch Unit Full Remote	£13
G11 Ultrasonic Teletext Handset	£24.00
8 C.H. Ultrasonic GEC Full Remote C20141I/C2219H	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£24.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
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BC213	10p
BC214	10p
BC237	10p
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BF195	10p
BF196	10p
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BF258	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF337	50p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF422	15p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF460	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF494	30p
BF594	10p
BF597	10p
BF760	30p
BF788	30p
BF819A	20p
BF858	30p
BF871	30p
BF869	30p

I.C. Holders

DIL – DIL		DIL – QIL	
40 Pin × 4	£1.00	16 Pin × 10	£1.00
42 Pin × 5	£1.00	18 Pin × 10	£1.00
28 Pin × 5	80p	28 Pin × 4	£1.00
16 Pin × 10	70p	AB Mains Switch	
24 Pin × 5	75p	u/v	30p
14 Pin × 10	70p	**Philips** Electrodynamic	
18 Pin × 10	80p	Stereo Headphones N6315	£10